

AI AUTOMOTIVE INDUSTRIES

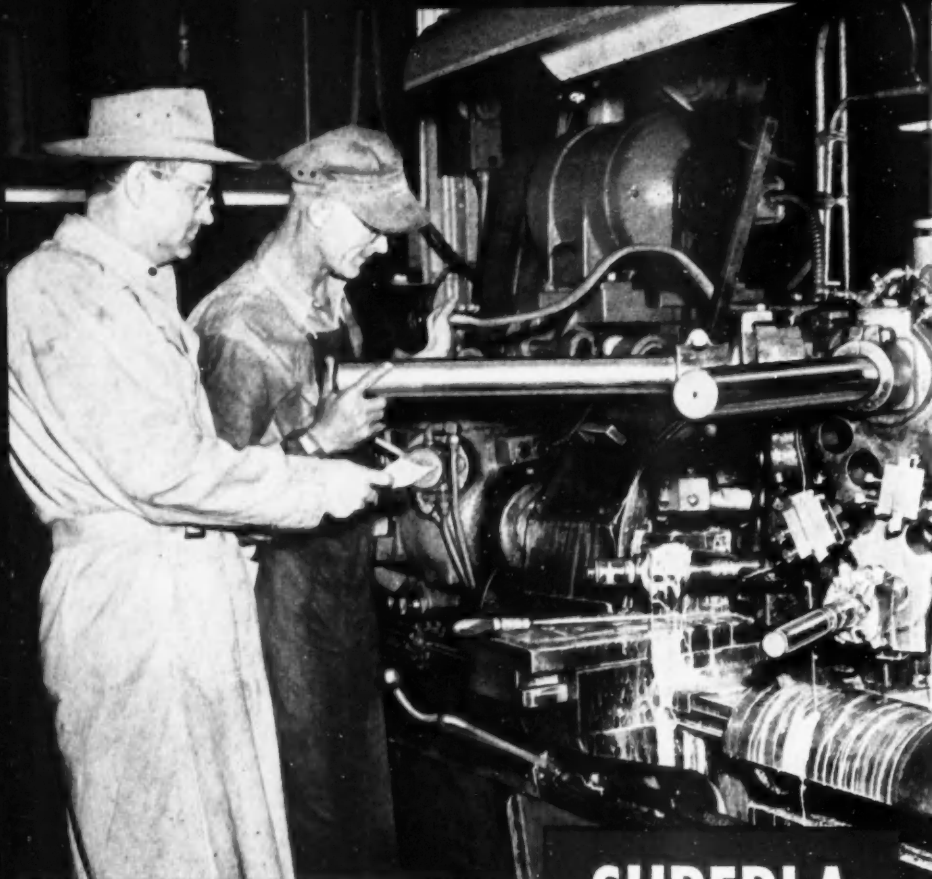
OCTOBER 1, 1953

AUTOMOTIVE and AVIATION MANUFACTURING
CIVILIAN AND DEFENSE
ENGINEERING • PRODUCTION • MANAGEMENT

In This Issue . . . Automated Engine Balancing . . . Russia's Strength
Today . . . Powerglide Governor Gears . . . Car Air
Conditioning Legal Problems . . . Hydra-Matic Fire
Recovery . . . Automatic Stamping and Welding

COMPLETE TABLE OF
CONTENTS, PAGE 3

A C H I L T O N P U B L I C A T I O N



The Four Wheel Drive Auto Co. benefits 4 ways with —————→

● Over a period of nearly 40 years, The Four Wheel Drive Auto Co., Clintonville, Wisconsin, has used SUPERLA Soluble Oil on an increasing variety of machining jobs. Shown above is a current operation performed on a semi-automatic turret lathe. The job calls for boring and turning of 1040 steel to produce differential case assemblies.

Company officials report that on this job, as on many other jobs employing milling machines, drill presses, and grinding machines, SUPERLA Soluble Oil has provided these four important benefits: **1.** Mixes readily with cold water. **2.** Forms stable emulsions. **3.** Helps hold close clearances and dimensions. **4.** Helps pro-

vide good finish and tool life.

The long and successful experience of The Four Wheel Drive Auto Co. with SUPERLA Soluble Oil testifies to the benefits you can obtain with this outstanding coolant.

The Standard Oil lubrication specialist serving your area of the Midwest has a complete line of metalworking fluids and compounds to offer you. He also has the experience and special training to help you use these products most effectively. You can reach this man by phoning your local Standard Oil (Ind.) office. Or write: Standard Oil Co., 910 South Michigan Avenue, Chicago 80, Illinois.

SUPERLA
REG. U. S. PAT. OFF.
Soluble Oil

STANDARD OIL COMPANY

What's YOUR problem!



R. E. O'Brien, of Standard Oil's Green Bay office, is the lubrication specialist who works closely with The Four Wheel Drive Auto Co. to assure maximum benefits from the use of SUPERLA Soluble Oil.

He is one of many lubrication specialists who make their headquarters in Standard's offices throughout the Midwest. These men have been specially trained in Standard's Lubrication Engineering Schools and, in addition, have a wealth of on-the-job experience. The specialist nearest your plant is ready to give prompt, expert and thorough attention to your lubrication problems.

A phone call to your local Standard Oil Company office will bring this man quickly to your plant—with no obligation to you, of course. Discuss with him the benefits offered you by such outstanding products as:

STANICUT Cutting Oils. These special-duty cutting oils meet today's most exacting requirements and highest production schedules. Grades vary in viscosity and compounding. Each contains the correct proportion of extreme-pressure and friction-reducing ingredients.

STANOSTAMP Compounds. Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical applications. STANOSTAMPS offer maximum protection for dies and work.

These compounds can be readily removed in conventional washing equipment.



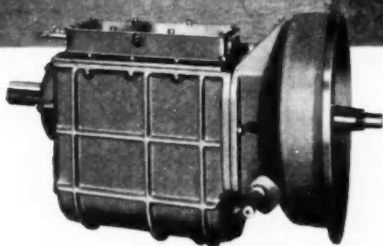
(Indiana)



down through the ocean shelf for oil...

COTTA TRANSMISSION

takes continuous heavy shock load!



Designed for
A Broad Range of Ratios
And Input Torques
From 150 to 2000 Foot Pounds

Drilling for oil in nature's tidelands is tough business. Tough drilling through layers of stone and solid rock. Tough on men and machines. Tough, certainly, on the transmission that powers the rig. But it's the kind of business "tough" Cotta Transmissions are built especially for.

In transmitting the high, constant speed of the engine to ratios suitable for drilling, this Cotta Multi-Speed Transmission is on a continuous, heavy-duty assignment. It's an assign-

ment where heavy shock loads result from the varying layers of rock, stone, sand, and muck. It's also an assignment where equipment failure cannot be risked!

Specialization has taught Cotta the "fine points" in design and construction of Heavy-Duty Transmissions and Reduction Units. So, if you build cranes, locomotives, drillers, generators, shovels, pumps or other heavy-duty equipment... why not see what Cotta has to offer you.

THIS INFORMATION WILL HELP YOU

Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

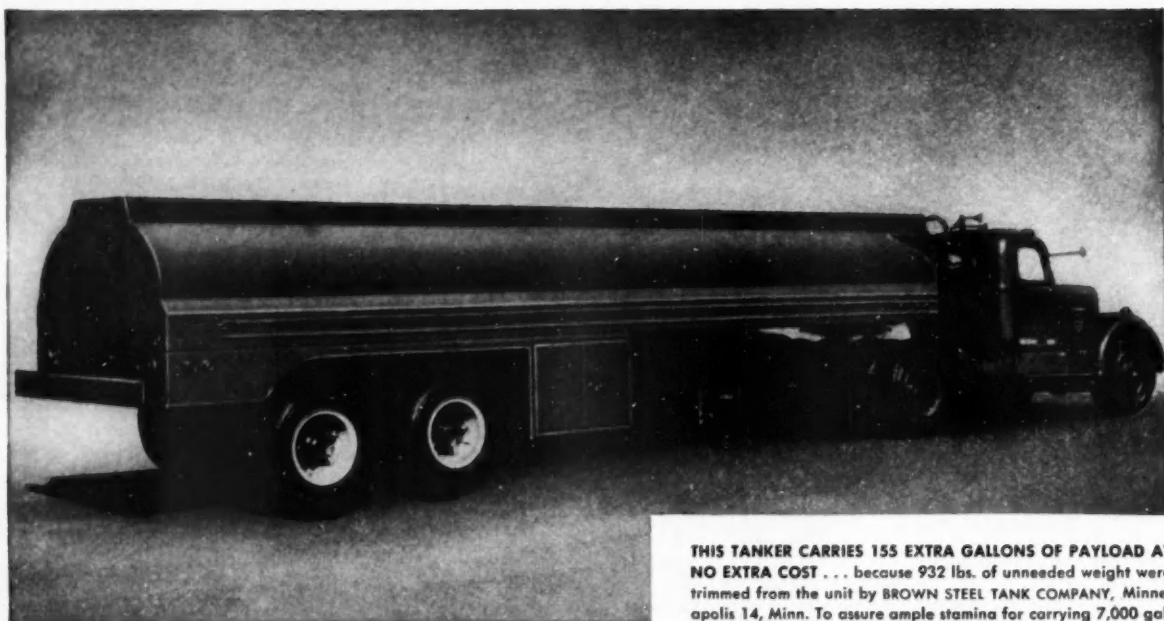
COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



COTTA

HEAVY-DUTY TRANSMISSIONS

"Engineered-to-order"



THIS TANKER CARRIES 155 EXTRA GALLONS OF PAYLOAD AT NO EXTRA COST . . . because 932 lbs. of unneeded weight were trimmed from the unit by BROWN STEEL TANK COMPANY, Minneapolis 14, Minn. To assure ample stamina for carrying 7,000 gallons of gasoline under all sorts of conditions, the builder utilized a high strength, low nickel alloyed steel trade-named CORTEN . . . produced by U. S. STEEL CORPORATION.

CUTS DEADWEIGHT OF TANK TO PERMIT

932 Lbs. Additional Payload

Stretch your dollars by cutting deadweight. Redesign your transport units to utilize low alloy high strength steels containing nickel . . .

Every pound trimmed off not only saves fuel, but lessens wear on tires and brakes . . . reduces operating expense and increases revenue per ton mile.

Thin, light sections of low alloy high strength steel containing nickel permit substantial weight reductions by providing the same strength as thicker, heavier sections of plain carbon steel.

Compared to carbon steels of equal strength, these nickel alloy steels show superior behavior in fabrication, including welding and cold forming, frequently effecting a decrease in working

costs and production time per unit structure.

The ability to resist many types of corrosion is another valuable characteristic of low alloy high strength steel sheets containing nickel. This property helps to lengthen the service life of vehicle bodies.

These steels containing nickel along with other alloying elements, are produced under various trade names by leading steel companies. Specify nickel alloyed steels to save weight without sacrificing strength and safety.

At the present time, nickel is available for end uses in defense and defense supporting industries. The remainder of the supply is available for some civilian applications and governmental stockpiling.



THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET
NEW YORK 5, N.Y.

A CHILTON MAGAZINE AI PUBLISHED SEMI-MONTHLY

AUTOMOTIVE INDUSTRIES

OCTOBER 1, 1953

VOL. 109, NO. 7

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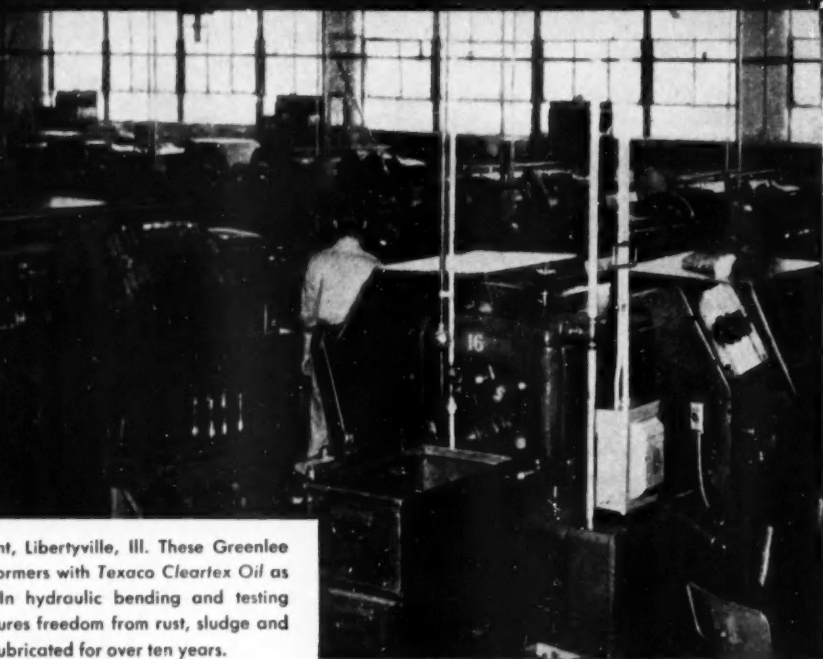


Audit Bureau
of Circulations

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly); May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.
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**"FOR OVER 10 YEARS,
TEXACO HAS HELPED
US TURN OUT MORE
AT LOWER UNIT COST—"**



ANCHOR COUPLING COMPANY plant, Libertyville, Ill. These Greenlee Automatic Screw Machines are top performers with Texaco Cleartex Oil as both coolant and machine lubricant. In hydraulic bending and testing machines, Texaco Regal Oil (R & O) assures freedom from rust, sludge and foam. The entire plant has been Texaco-lubricated for over ten years.

ANCHOR COUPLING COMPANY specializes in the manufacture of hydraulic hose with special couplings. Steel, brass and aluminum are machined on various machines, including a battery of 13 Greenlee automatics. Texaco Cutting Coolants and Hydraulic Oils have been used exclusively for over ten years, with outstanding results:

"We get top-speed production with Texaco, and the finish of parts coming through is excellent. Tool life has been exceptional. In addition, the help rendered by Texaco Lubrication Engineering Service has been an invaluable asset to us."

And so it is in every type of plant, wherever located. *Texaco Cutting, Grinding and Soluble Oils* and other Texaco Industrial Lubricants—used in conjunction with Texaco Lubrication Engineering Service—are helping manufacturers produce more at a lower unit cost.

Let a Texaco Lubrication Engineer help you gain these important benefits. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

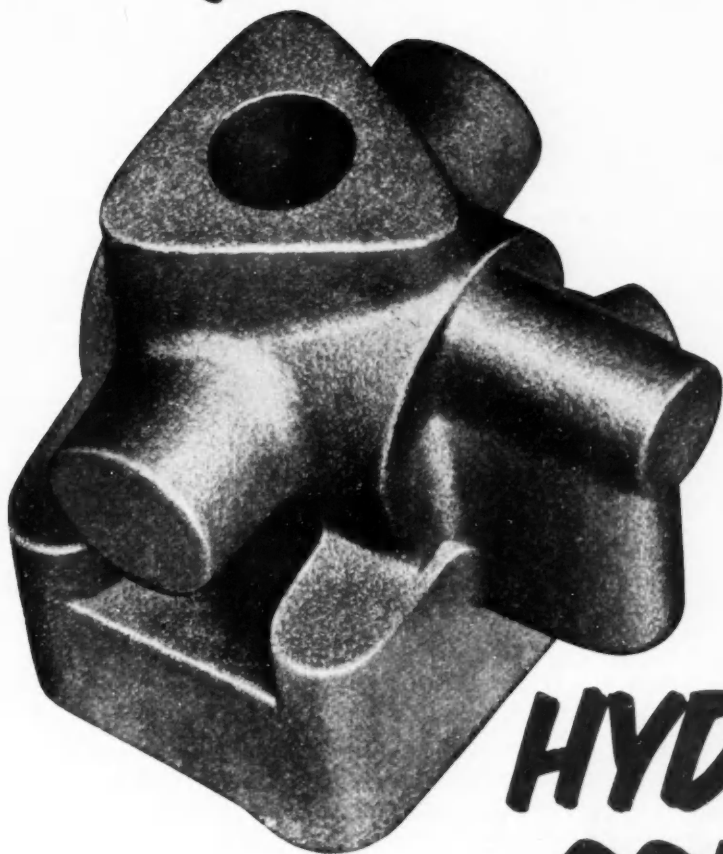
☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



TEXACO Lubricants, Fuels and
Lubrication Engineering Service

Eaton Permanent Mold Gray Iron Castings—



for
**HYDRAULIC
CONTROLS**



Send for your free copy of the 32-page illustrated booklet: "The Eaton Permanent Mold Foundry." It tells the story of Permanent Mold Castings and takes you on a picture-tour of the Eaton Foundry at Vassar, Michigan.

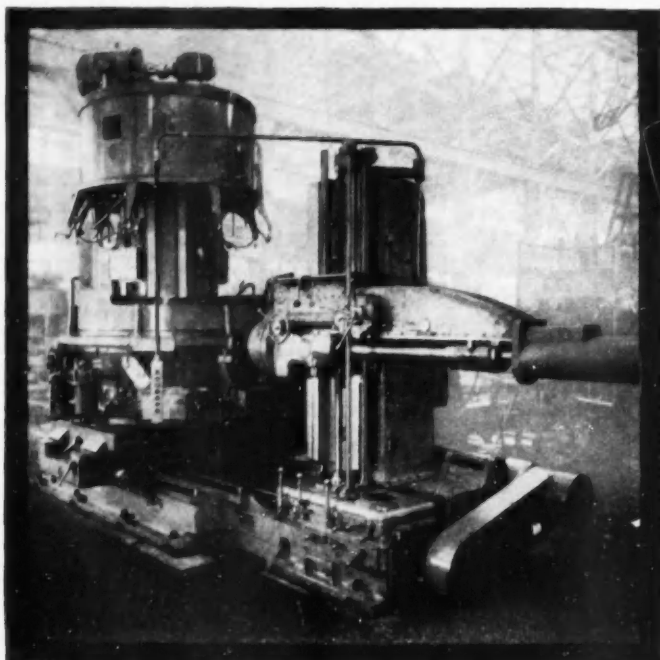
EATON MANUFACTURING COMPANY

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This load was placed as illustrated. Hand cranking was used on both table and saddle and both were moved with comparative ease considering the 18½ ton load.

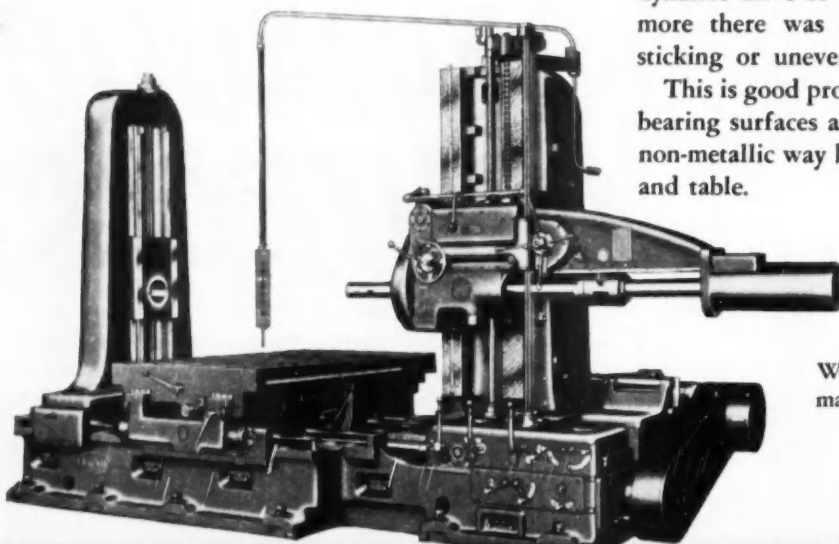
*No Trick...
Actual
Test*

37,000 lb. LOAD . . .

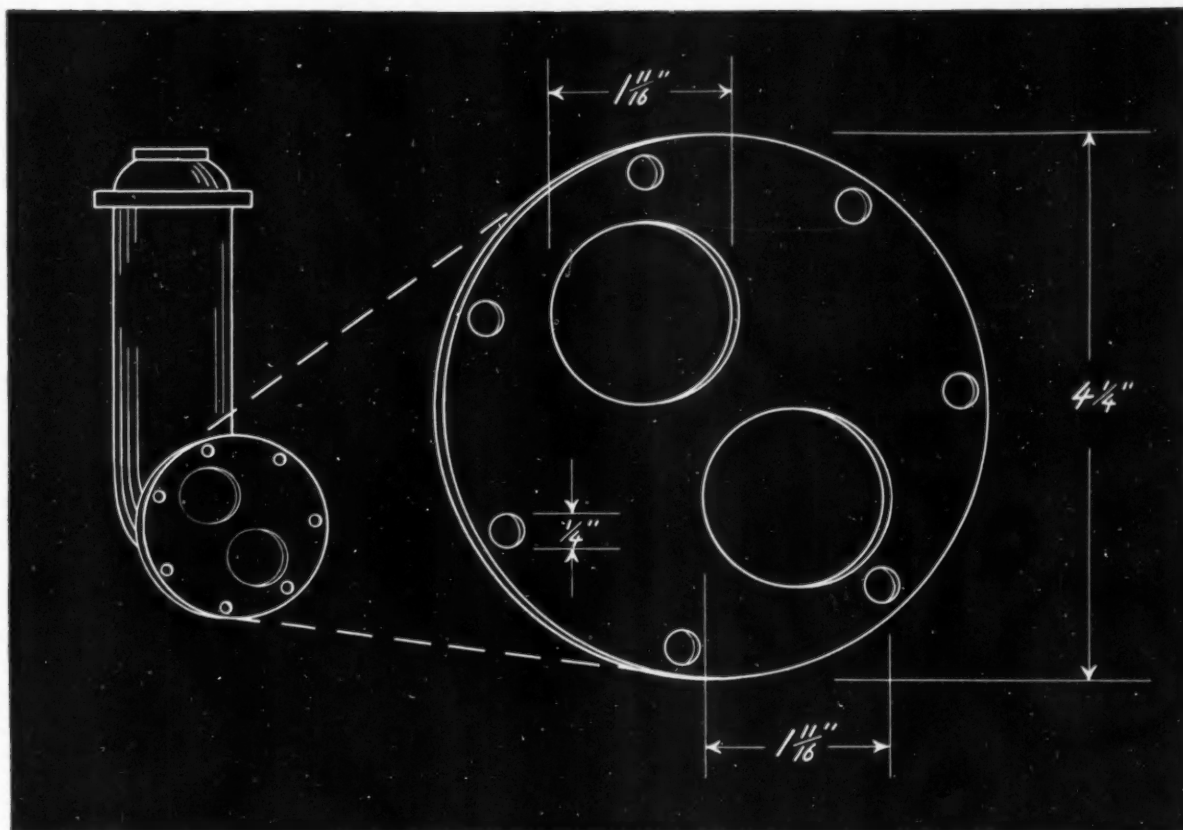
To test the load distribution and ease of action of the table and saddle on the BULLARD new 4-WAY BED HORIZONTAL BORING MACHINE, this test was actually made by placing a Type "D" MULT-AU-MATIC on the table.

Fine power feed and rapid traverse were then applied and movements made in all directions with extreme smoothness and no overloading of the hydrodynamic drive or drive motor. Furthermore there was no tendency toward sticking or uneven motion.

This is good proof of well distributed bearing surfaces and the smoothness of non-metallic way bearings of the saddle and table.



When writing for information refer to BU 206.



*This fiber gasket seals perfectly
even on a rough milled surface*

A manufacturer had the problem of making a tight seal between the oil cooler and the cylinder block on a diesel engine. Since machining a smooth finish on the milled cylinder block would be expensive, he hoped to find a gasket that would give a tight seal against the block's uneven surface.

At first he had nothing but trouble and oil leaks. Then he tried an entirely new kind of fiber gasket material—Armstrong's Accopac®. This new fiber gasketing has the compressibility needed to make a positive seal even where pressure is relatively low.

Cork particles make it compressible. Finely ground cork particles—thousands of them—are added to Accopac's fiber and latex composition for extra compressibility. Accopac conforms to every surface irregularity and is especially useful in preventing distortion on light flanges where bolt pressures must be kept low.

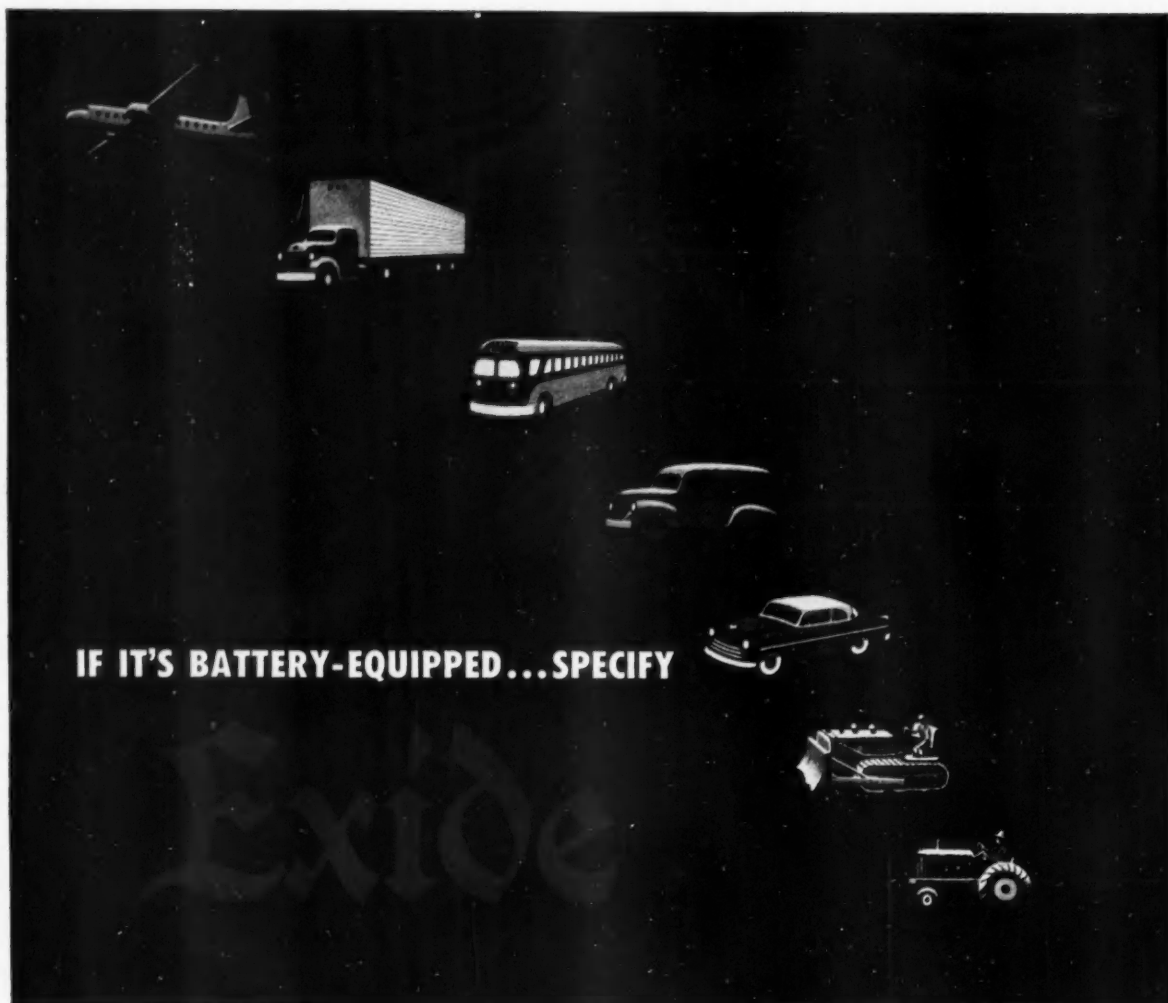
Won't shrink, won't grow. Accopac overcomes another common difficulty of fiber gaskets—the tendency to lose the binder due to the solvent action of hot oil. Accopac gaskets won't shrink, dry out, or leak in any recommended application.

Each fiber and cork particle is literally locked in rubber by coating it with latex *before* the sheet is formed. For this reason, Accopac isn't materially affected by changes in humidity or temperature. You can store Accopac replacement gaskets for months and still have them fit and seal perfectly.

Write for samples. You may find Accopac helpful in reducing costs or replacing an unsatisfactory gasket. Accopac is available in sheets, rolls, ribbons, or die-cut shapes. For samples, call your nearest Armstrong office or write us. Armstrong Cork Company, Industrial Division, 7010 Imperial Avenue, Lancaster, Penna.



ARMSTRONG'S ACCOPAC



IF IT'S BATTERY-EQUIPPED...SPECIFY

With Exide batteries your equipment will always get off to a good start: automobiles, trucks, tractors, off-the-highway equipment, aircraft and watercraft. In operation, Exide batteries offer exceptionally low maintenance cost... dependable year-round performance.

Today's Exide battery is the product of years of progressive research-engineering, and proved by intensive testing under both laboratory and actual field conditions.

Exide engineers, working in the largest and most modern laboratories in the battery business, will cooperate with you on any storage battery problem.

1888...DEPENDABLE BATTERIES FOR 65 YEARS...1953

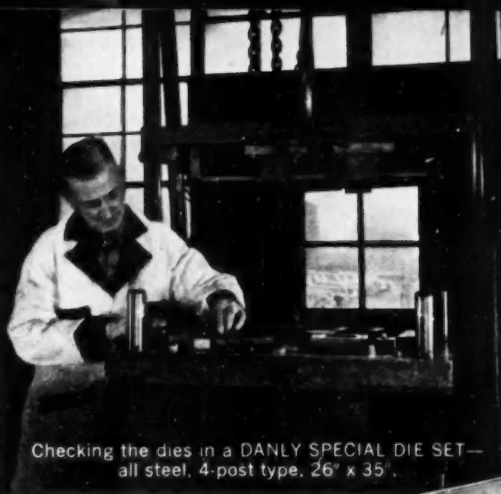
THE ELECTRIC STORAGE BATTERY CO., Philadelphia 2 • Exide Batteries of Canada, Limited, Toronto

"Exide" Reg. T.M. U.S. Pat. Off.



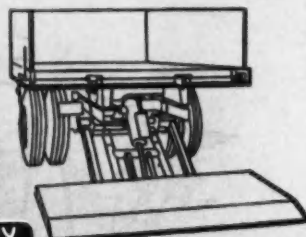
STARTING POWER

for light, medium, or
heavy-duty service

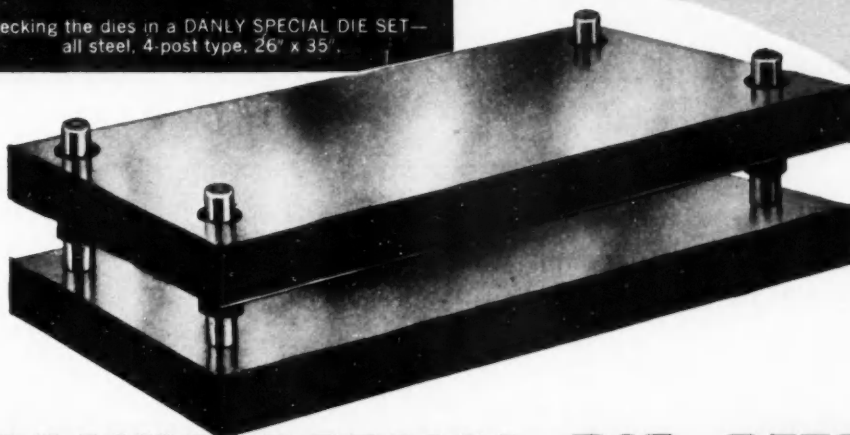


Checking the dies in a DANLY SPECIAL DIE SET—
all steel, 4-post type, 26" x 35"

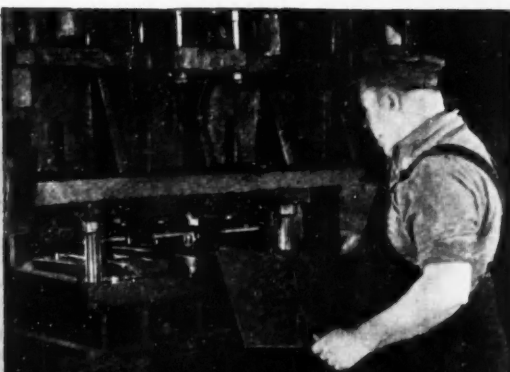
ANTHONY
LIFT GATE
HYDRAULIC



SHOWN IN LOADING POSITION



DANLY SPECIAL DIE SETS



View showing DANLY SPECIAL DIE SET during
production run. Tail gate gussets are blanked and
pierced in a single stage operation from 10 gage
blue annealed sheet.



DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

help Anthony give industry a lift !

For years now, the Anthony Company, makers of hydraulic lift gates for motor trucks, has relied on Danly Special Die Sets in their production operation. Based on long experience, they've found that Danly Special Die Sets cut their tooling costs and save time . . . because they provide the finest precision starting point for diemaking. Why not build your production dies in Danly Special Die Sets? . . . see what die performance can really mean.

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue, Chicago 50, Illinois

**DANLY SPECIAL DIE SET SERVICE
IS FAST AND CONVENIENT—CALL
YOUR NEAREST DANLY BRANCH**

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*CLEVELAND 14 _____ 1550 East 33rd Street

*DAYTON 7 _____ 3196 Delphos Avenue

*DETROIT 16 _____ 1549 Temple Avenue

*GRAND RAPIDS _____ 113 Michigan Street N.W.

INDIANAPOLIS 4 _____ 5 West 10th Street

*LONG ISLAND CITY 1 _____ 47-28 37th Street

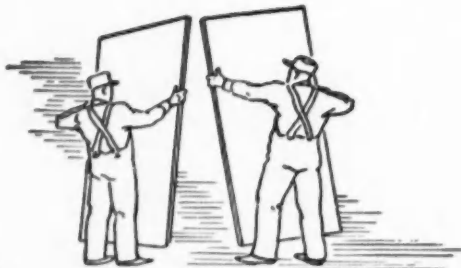
*LOS ANGELES 54 _____ Ducommun Metals & Supply Co.,
4890 South Alameda

MILWAUKEE 2 _____ 111 East Wisconsin Avenue

*PHILADELPHIA 40 _____ 511 W. Courtland Street

*ROCHESTER 6 _____ 33 Rutter Street

*Indicates complete stock



Have you a similar fastening problem?

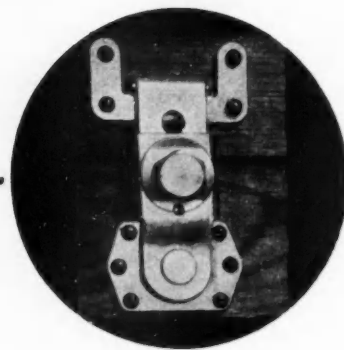
How a strong structure can be designed for speedy and simple assembly with unskilled labor, no special tools...



The U. S. Air Force wanted a jet-aircraft hangar design that would be portable by air, yet strong; would assemble quickly; be interchangeable, and flexible enough for easy structure modification.

The answer lay in a panel structure using modular units. Armorply honeycomb panels faced with thin aluminum, developed by United States Plywood Corporation, provide lightness, strength, flexibility. Joining one panel to the other in the field with untrained help was a problem until Simmons Fastener developed LINK-LOCK, a simple latching device that operates with minimum wrench pressure on hex nut.

This fastening problem is being successfully met by combining the design ingenuity of No. 1 LINK-LOCK with the proved performance of honeycomb plywood panels.



No. 1 LINK-LOCK—like No. 2 LINK-LOCK—features simplicity, positive action, high strength.

No springs are used in No. 1 LINK-LOCK. Locking action is obtained by rotating a nut that moves a sliding latch in and out of position. Up to 1500-lb. pull-down pressure is available; the device carries up to 4000-lb. tension. No. 1 LINK-LOCKS provide for surface mounting, simplifying installation.

Where can you use it? When you need heavy fastening pressures, resistance to impact, operation in 70-below temperatures—and where ease of action, compactness, and low cost are important factors. Write for a No. 1 LINK-LOCK Data Sheet.

SIMMONS FASTENER CORPORATION
1749 No. Broadway, Albany 1, New York

FASTENERS THAT IMPROVE PRODUCTS AND REDUCE ASSEMBLY COSTS

Simmons

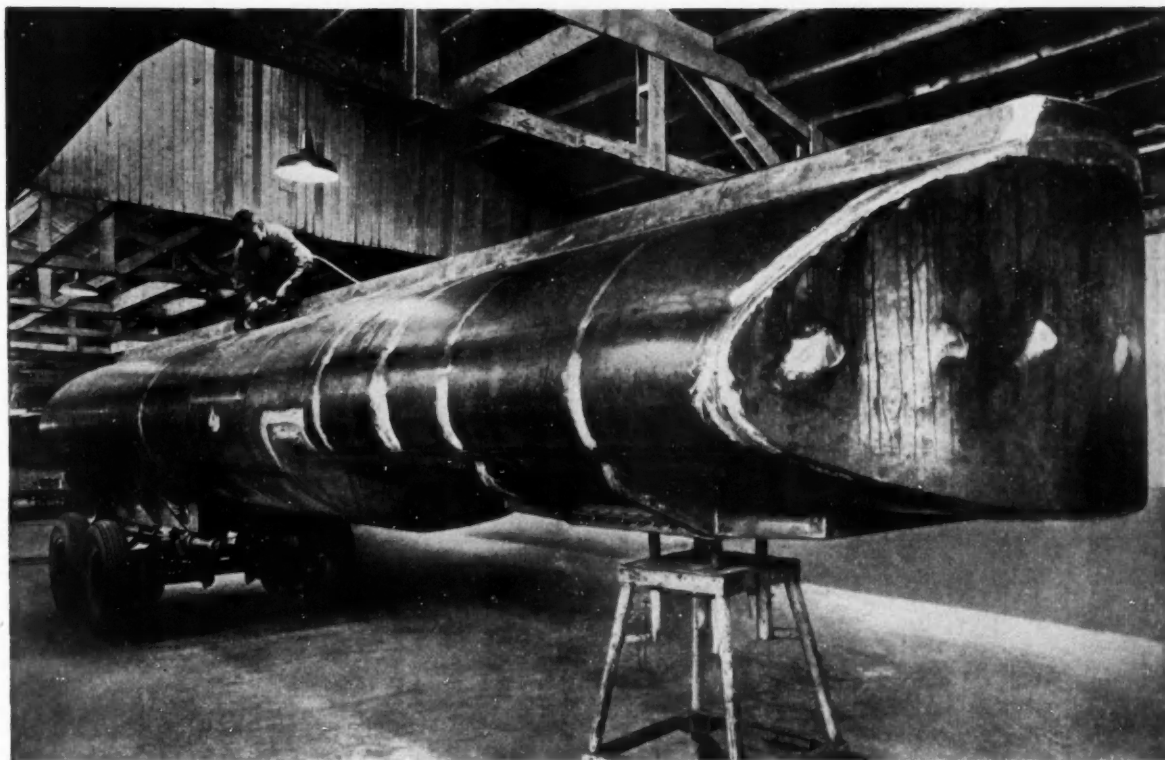
QUICK-LOCK SPRING-LOCK ROTO-LOCK LINK-LOCK DUAL-LOCK

JUST OUT! NEW 36-PAGE CATALOG WITH APPLICATIONS. SEND FOR IT!

DEADWEIGHT DOWN 1150 LBS . . .

CAPACITY UP 190 GALS . . .

On this *Mayari R* Clipper Tank



Industrial Steel Tank and Body Works, Oakland, California, are the builders of this 6500-gal clipper tank for General Petroleum Corporation.

This frameless semi-trailer unit for General Petroleum Corporation will make service-station deliveries of gasoline in the Oakland area of California.

When she rolls along her route, she'll carry a total payload of 6500 gal in her six compartments, an increase of 190 gal, because she's built of Mayari R low-alloy, high-strength steel. At the same time, the use of Mayari R cut deadweight 1150 lb.

You can expect advantages like this when you use Mayari R in vehicle construction. You can use it in thinner sections without sacrificing strength, because Mayari R has a yield point nearly double that of plain carbon steel. And you can use the same fabricating and welding methods you would ordinarily use, with plain carbon steel.

Mayari R gives 5 to 6 times more protection against atmospheric corrosion than carbon steel, and retains paint up to 80 pct longer, depending on the type of paint used.

If you think Mayari R might fit into your current or future plans, you'll find much useful information about it in our Mayari R catalog. Write or phone for a copy.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

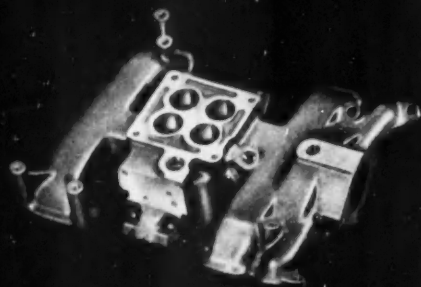
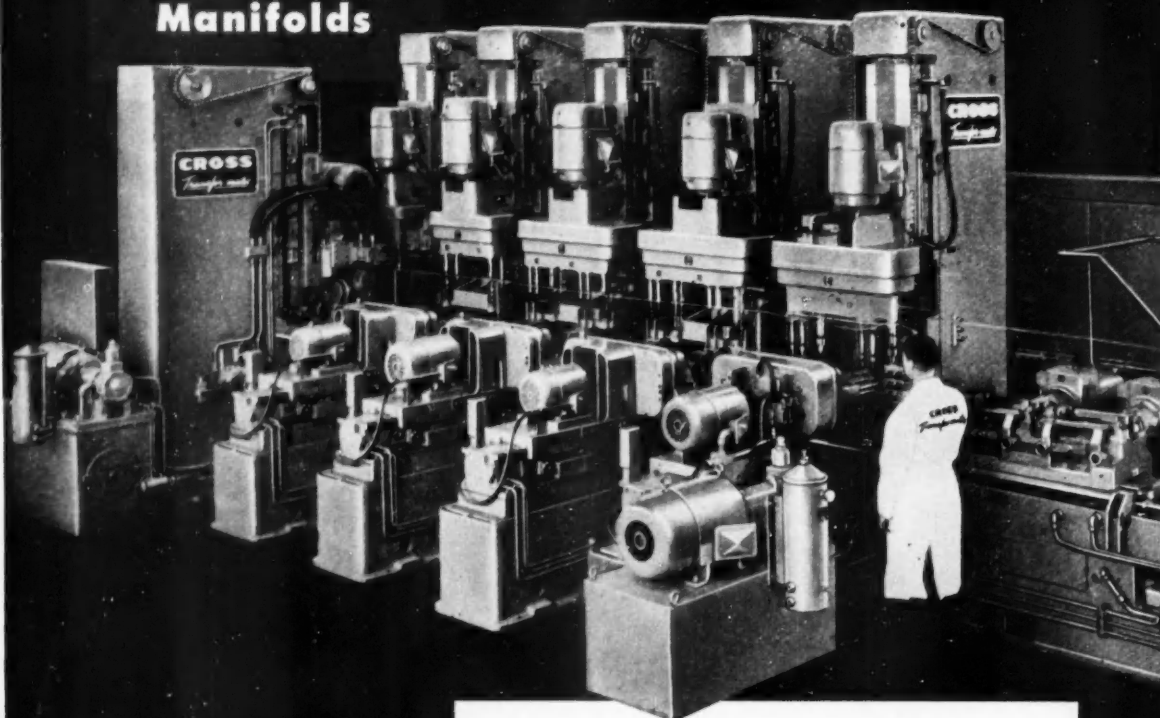
On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation. Export
Distributor: Bethlehem Steel Export Corporation



Mayari R *makes it lighter...stronger...longer lasting*

**Drills,
Bores, Mills,
Intake
Manifolds**

Another Transfer-matic by Cross



- ★ 218 parts per hour at 100% efficiency.
- ★ Seven stations including loading and unloading.
- ★ 54 operations—22 drilling, 8 chamfering, 2 reaming, 12 tapping, 8 boring and 2 milling.
- ★ Two parts machined at one time in each station.
- ★ Palletized work holding fixtures and automatic transfer from station to station.
- ★ Power wrenches for automatically operating work holding fixtures.
- ★ Other features: Pre-set tools, built-in chip conveyor, automatic cleaning unit for removing chips from fixtures, J.I.C. Standard Construction.

Established 1898

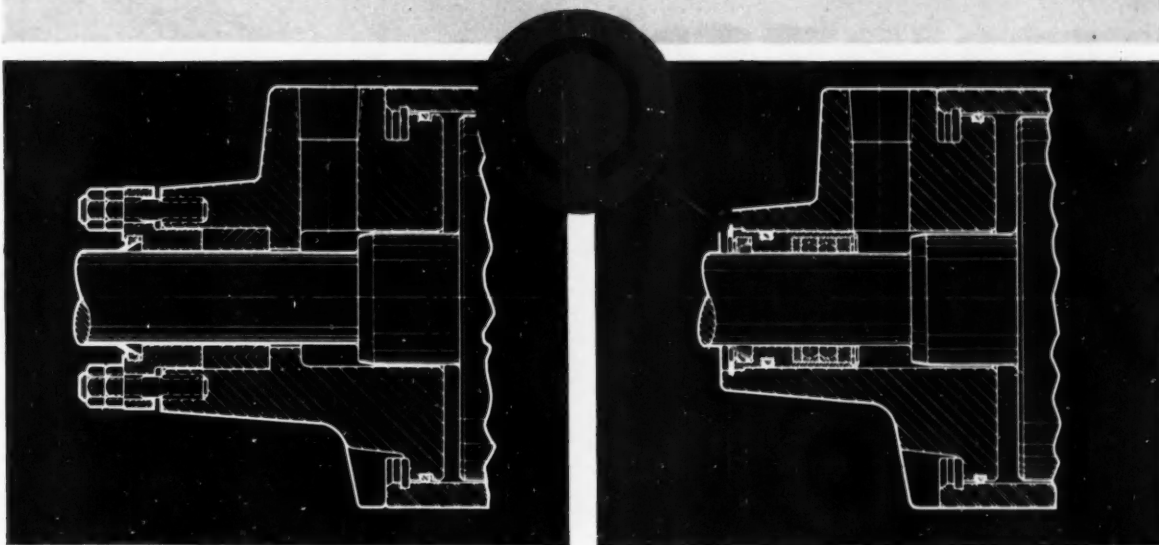
THE

CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

Waldes Truarc Ring Saves \$2.84 Per Unit, Cuts Labor-Time and Materials in Hydraulic Packing Unit



OLD STYLE stuffing box required skilled worker to install packing rings one at a time, then adjust packing glands by trial and error. Disassembly was equally difficult, time-consuming and costly.

NEW Monopak Cartridge is smaller, lighter, streamlined and installed with one Truarc Retaining Ring. Disassembly and reassembly with new cartridge takes unskilled worker just 1 minute.

Hydraulic Accessories Company of Van Dyke, Michigan, uses a single Waldes Truarc Inverted Ring (internal series 5008) to hold Monopak Cartridge in cylinder head.

New design eliminates costly machining and saves 2½ lbs. of material. Re-design with Waldes Truarc Retaining Ring reduces stuffing box diameter from 3½" to 2⅞", and reduces length from 5⅞" to 4⅜". Allows savings in assembly, adjusting and testing.

NEW DESIGN USING WALDES TRUARC RING PERMITTED THESE SAVINGS PER UNIT

MACHINE TIME SAVED:

| | |
|--|--------|
| Chuckling, facing and boring . . . | \$.72 |
| Drilling and tapping 3 holes . . . | .18 |
| Drilling and counterboring 3 holes . . . | .12 |
| Assembling, adjusting, testing . . . | .90 |

MATERIAL SAVED:

| | |
|-----------------------------|-----|
| 1½ lbs. cast iron | .30 |
| ½ lb. bronze | .23 |
| 3 studs | .36 |
| 3 nuts | .03 |

TOTAL \$2.84

Waldes Truarc Retaining Rings are precision-engineered . . . quick and easy to assemble and disassemble. Always circular to give a never-failing grip. They can be used over and over again. There's a Waldes Truarc Ring to answer every fastening problem.

Find out what Waldes Truarc Retaining Rings can do for you. Send your blueprints to Waldes Truarc engineers for individual attention, without obligation.

For precision internal grooving and undercutting . . . Waldes Truarc Grooving Tool.



SEND FOR NEW CATALOG

WALDES

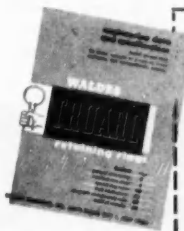
TRUARC

REG. U. S. PAT. OFF.

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,392,947; 2,392,948; 2,416,952; 2,420,921; 2,420,341; 2,439,789; 2,441,846; 2,469,163; 2,493,390; 2,493,393; 2,497,002; 2,497,003; 2,491,306; 2,509,061 AND OTHER PATENTS PENDING



Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.

Please send me the new Waldes Truarc Retaining Ring catalog.

(Please print)

AY-105

Name _____

Title _____

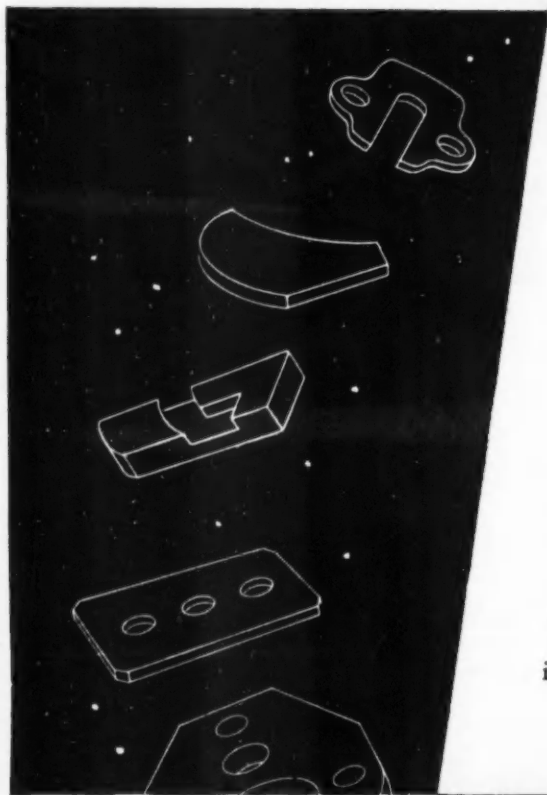
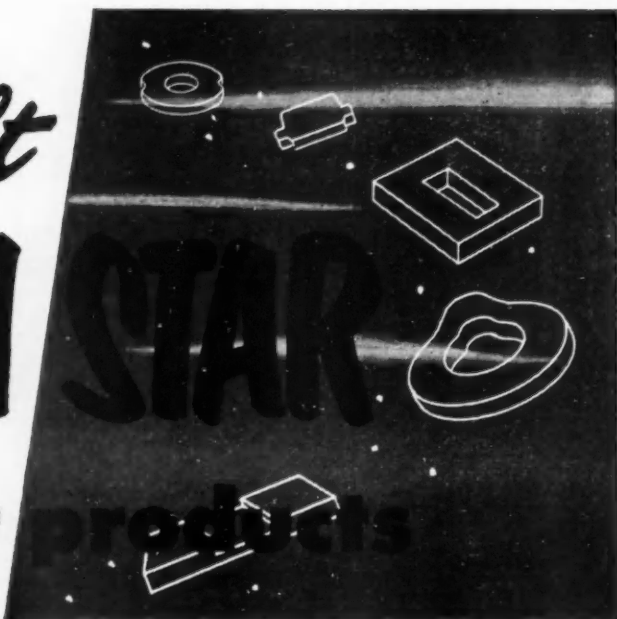
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Sheet and roll felt manufactured for special purposes and to meet all S.A.E. and military specifications.

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Its efficiency in absorbing vibration, cushioning loads, providing oil-tight seals, keeping parts dust free, evening temperatures, filtering, lubricating, etc., is the highest obtainable.

Investigate Western Felt. Engineers expert in felt uses will gladly work with you to improve your product or industrial operation.

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MANUFACTURERS AND CUTTERS OF WOOL FELTS

**BROACH FOUR SURFACES
OF SLEEVE YOKE EARS**

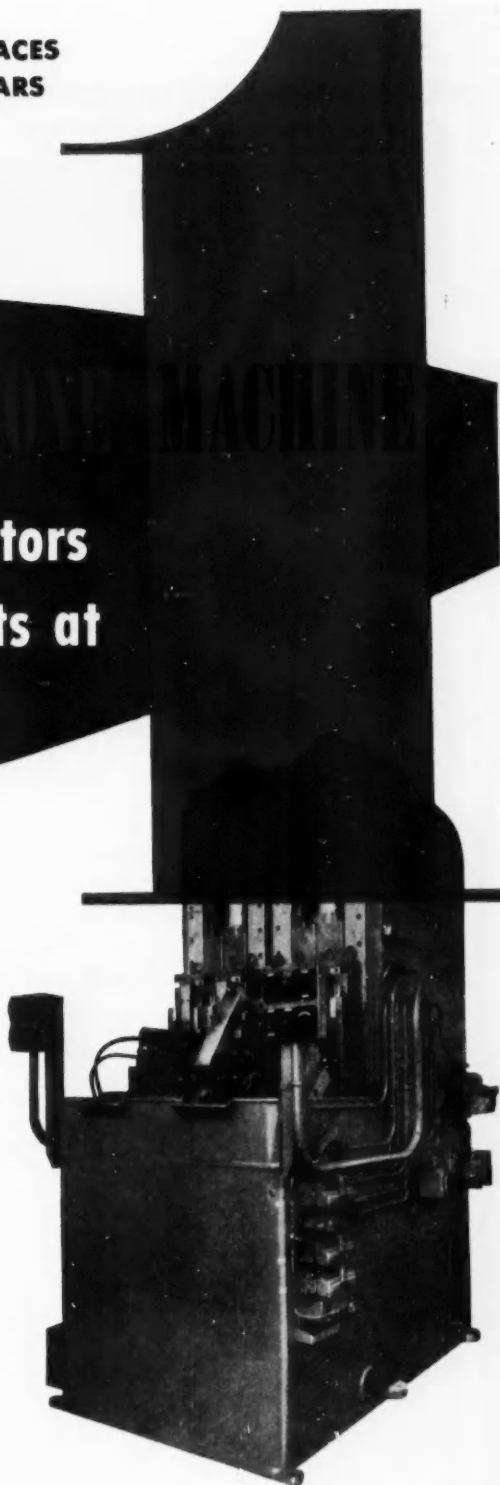
**with interchangeable locators
broaches 3 similar parts at
500 per hour**

THE *American* WAY

Two, two-station base fixtures, mounted on tilting work tables, and arranged with automatic clamping, permit finish broaching the outside and inside faces of the ears on the sleeve yoke parts illustrated . . . at the rate of 500 parts per hour. Interchangeable locators makes it possible to broach any one of three similar parts on this American SBD-48-25 dual ram surface broaching machine.

The savings in time and the resulting low cost per unit are obvious. Such results, however, are typical when American engineers apply the knowledge and experience accumulated during the past 27 years to the practical solution of broaching problems.

Write, sending sample part or detail drawing and mention your hourly requirements. Our Engineering Department will be glad to furnish recommendations for the right machine and the proper tooling. And remember, American manufactures all three . . . broaches, machines and fixtures to give you a properly engineered, balanced solution to your metal removing problems. Address Dept. I.



American BROACH & MACHINE CO.
A DIVISION OF SUNSTRAND MACHINE TOOL CO.

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See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery





FOREMOST IN SCIENTIFIC DEVELOPMENT

IN THE REALM OF FORGING
DESIGN AND THE DEVELOPMENT
OF PROPER GRAIN-FLOW, WYMAN-
GORDON HAS ORIGINATED MANY
FORGING DESIGNS WHICH AT THE
TIME OF THEIR DEVELOPMENT
WERE CONSIDERED IMPOSSIBLE
TO PRODUCE BY FORGING.

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ESTABLISHED 1883

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Now! get faster, easier starts ... FOR ANY GAS OR DIESEL ENGINE even at 65° below!

WITH PRE-HEATING SYSTEMS

**One heater provides all 3! ...
Engine starting, cab heating
—defrosting!**

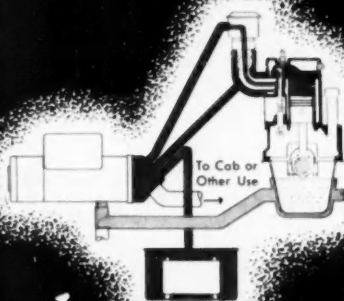
Another Revolutionary South Wind First! With South Wind Pre-Heating Systems you get the same quick, reliable engine starting for any gas or diesel engine that major aircraft and military vehicles enjoy! First choice of engineers and maintenance men, they're designed to make starting easier at all temperatures—even 65° below!

Never Before such compactness, such power, such adaptability! *Heater* provides engine pre-heating, cab heating and defrosting! Economical, too! South Wind Pre-

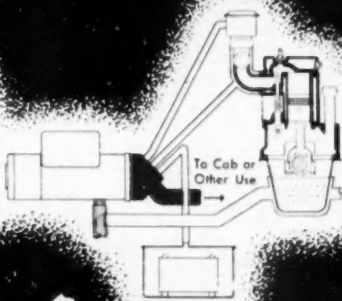


Model 978 HP
20,000 BTU/hr.
fresh air output
Total output, 30,000 BTU/hr.

2-PHASE EXTERNAL PRE-HEATING



1
Pre-Heat Phase. Clean, dry hot air is applied to the exterior surface of the carburetor and intake manifold, and to the battery, by the use of shrouds. The oil sump is heated in like fashion by hot gases from the heater exhaust. (Clean, hot air which enters the air intake is, in some cases, provided for the starting phase.)



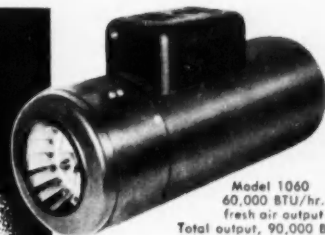
2
Operational Phase. After starting engine, clean, hot air from the heater is diverted to cab for personnel heating, defrosting and other uses. (If the application demands, part of this air can be used to provide continuous heat for battery and/or air induction system.) Heater exhaust is diverted directly to atmosphere.

Heating Systems reduce battery drain by reducing starting torque—cut the cost of starting aids. Eliminate the shock loads imposed by brute-force starting methods. Lower maintenance costs—prolong engine life!

Clean, Dry Air is delivered to engines by South Wind Heaters! They permit use of optimum viscosity lubricants and assure normal lubrication at all times. Remove moisture—inhibit sludge formation and freeze-up of engine accessories, too.

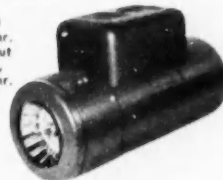
A Model for Every Requirement! South Wind Heaters meet every *internal* or *external* pre-heating need. They include units of 20,000, 30,000, 50,000, 60,000, 100,000, 200,000, 600,000, and 700,000 BTU/hr. capacities.

An experienced staff of South Wind Field Engineers is ready to consult with you on any pre-heating problem. Write today to South Wind Division, Stewart-Warner Corp., Indianapolis 7, Ind.



Model 1060
60,000 BTU/hr.
fresh air output
Total output, 90,000 BTU/hr.

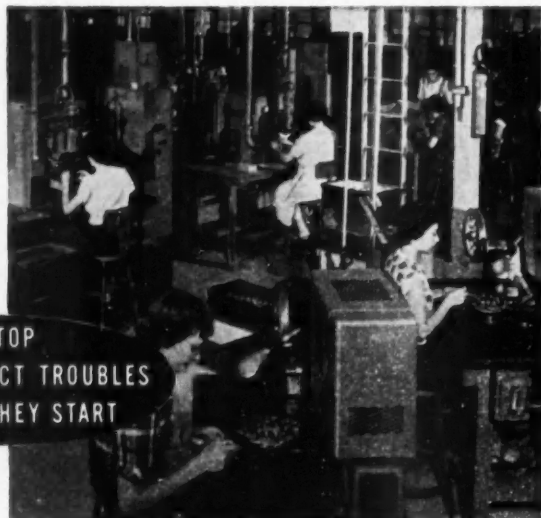
Model 1030
30,000 BTU/hr.
fresh air output
Total output,
50,000 BTU/hr.



South Wind
A PRODUCT OF
SW
STEWART-WARNER
**PERSONNEL HEATING
ENGINE AND
EQUIPMENT PRE-HEATING
WINDSHIELD DEFROSTING**

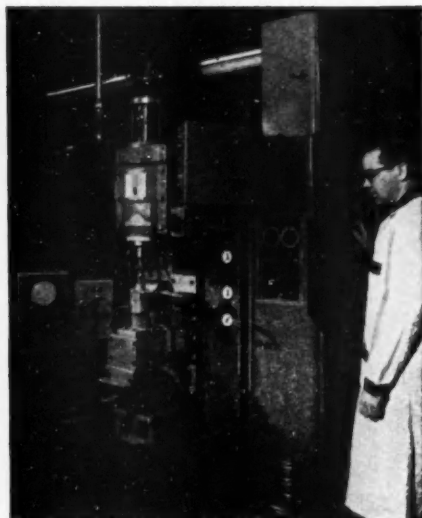
What a Combination!

For better contact assemblies... **EXPERIENCE—35 years...**
FACILITIES—include complete resistance welding equipment.



STOP
YOUR CONTACT TROUBLES
BEFORE THEY START

These resistance welders occupy a part of 100,000 feet of floor space devoted to contact production.



Resistance welding machine in the Mallory Contact Engineering Laboratory.

The complete facilities for making contact assemblies at Mallory include spot, projection, tape and point welding machines... as well as five types of brazing equipment. Thus, Mallory engineers are unrestricted in their choice of the one best assembly method to fit your particular needs.

When you bring your contact problems to Mallory, you get the advantage of an unequalled source of data and experience in resistance weld-

ing techniques... another important factor that assures precision and uniformity for the contacts in your products.

A complete range of contact materials and production methods results in lower cost contacts produced to your requirements.

For complete information, write us today. Our engineers will be glad to study your requirements... answer your questions.

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Electrical Contacts and Contact Assemblies

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Revere Electric Welded Steel Tubing

Available from $\frac{1}{4}$ " to $4\frac{1}{2}$ " O.D. —
Walls from .025" to .187"

A leading maker of appliances was using a heavy tubular member as a wringer post extension. With the collaboration of Revere Steel Tube engineers, the manufacturer developed a simple fabricated part of Revere Electric Welded Steel Tube, supplied ready for assembly. This reduced the thickness of the tube wall by half, cutting costs considerably and making the machine somewhat lighter and thus more attractive to users.

Revere offers you Electric Welded Steel Tube in the shapes shown here, and many others. The tube can be made so it is impossible to find the weld. Our Technical Advisory Service will gladly collaborate with you on applications to your product.

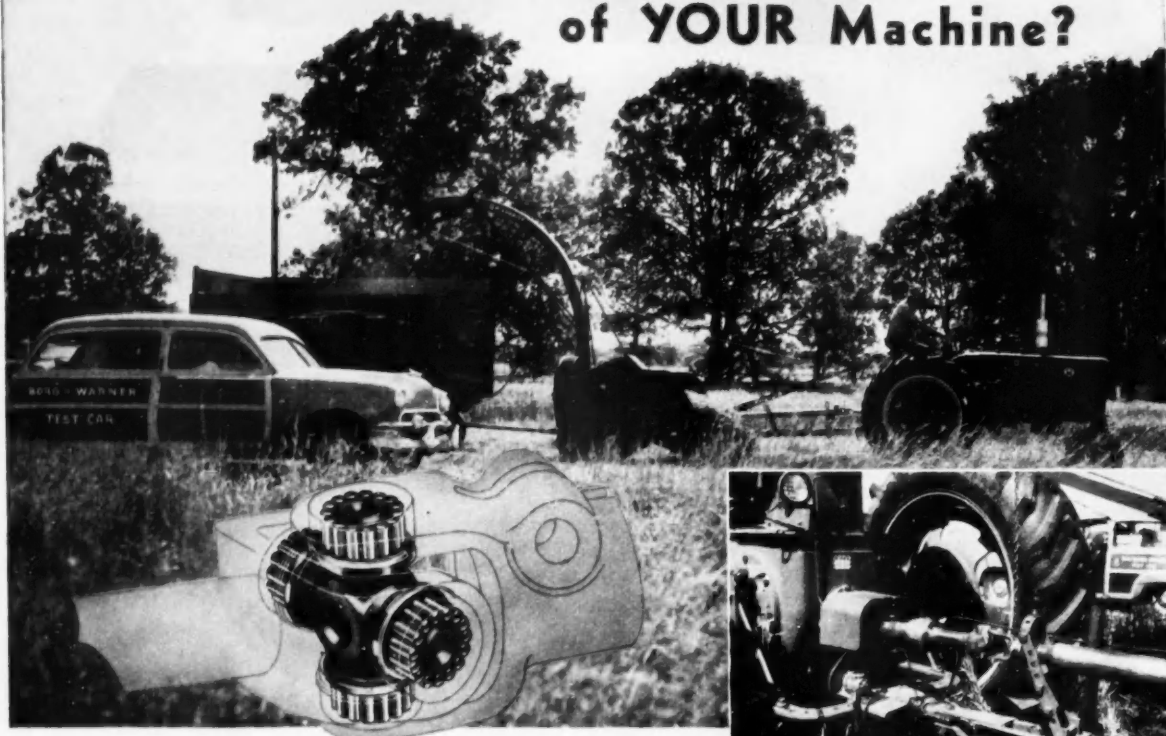
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230 Park Avenue, New York 17 N. Y.

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— Out in the Field or on the Road — Under Actual Working Conditions

The apparatus in the Borg-Warner test car makes continuous torque readings and shaft speed recordings from minimum operating speeds and loads up to maximum speeds, peak horsepower requirements and stall loads. This mobile test equipment has made numerous, highly accurate operation recordings of cars, trucks, tractors, farm machines, clutch units and industrial machinery. MECHANICS engineers utilize these Borg-Warner tests to insure adequate strength and stamina in MECHANICS Roller Bearing UNIVERSAL JOINT applications. Let them recommend the right joints for your machine's torque and horsepower.

MECHANICS UNIVERSAL JOINT DIVISION

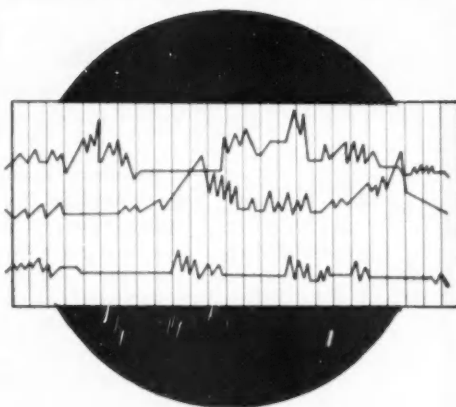
Borg-Warner • 2024 Harrison Avenue, Rockford, Illinois

MECHANICS
Roller Bearing 
UNIVERSAL JOINTS

For Cars • Trucks • Tractors • Farm Implements • Road Machinery •
Aircraft • Tanks • Busses and Industrial Equipment



Special attachments to test torque peaks and shaft speeds are located on the machine being tested. The readings are conveyed by wire to the several test units in the car — where accurate recordings are made and computed.

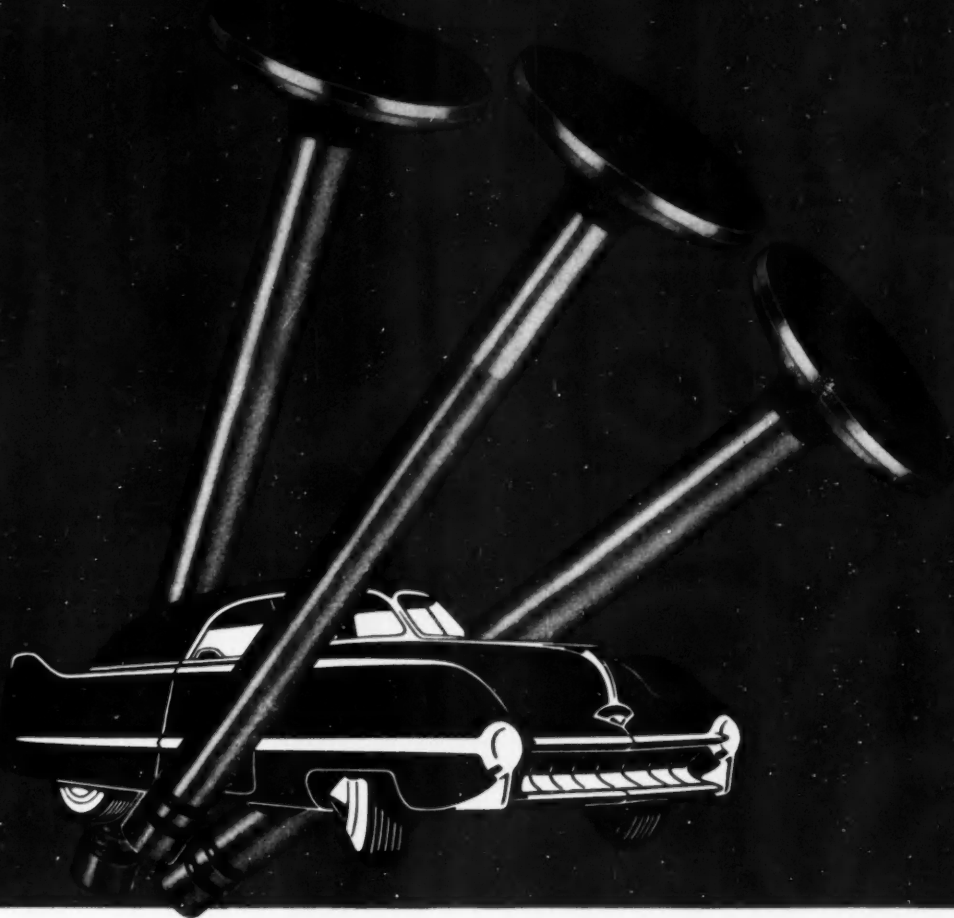


Continuous torque readings and shaft speeds are recorded on tape by the oscillograph unit to provide a permanent, accurate record of the machine's operating characteristics from which life expectancy can be computed.

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Automotive vehicle and engine manufacturers, using Permitem Valves as original equipment, know they can count on valve performance that fully meets today's high efficiency standards. They know that Permitem engineers stand ready to cooperate with them at all times on any troublesome valve problems. They have found that Permitem's ample facilities mean dependable deliveries. We invite you to consult with us on your requirements for valves, pistons and other engine parts.

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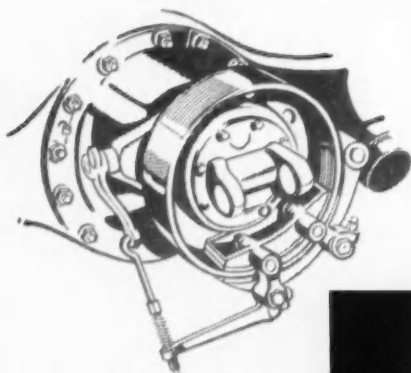
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New York: 9 Rockefeller Plaza

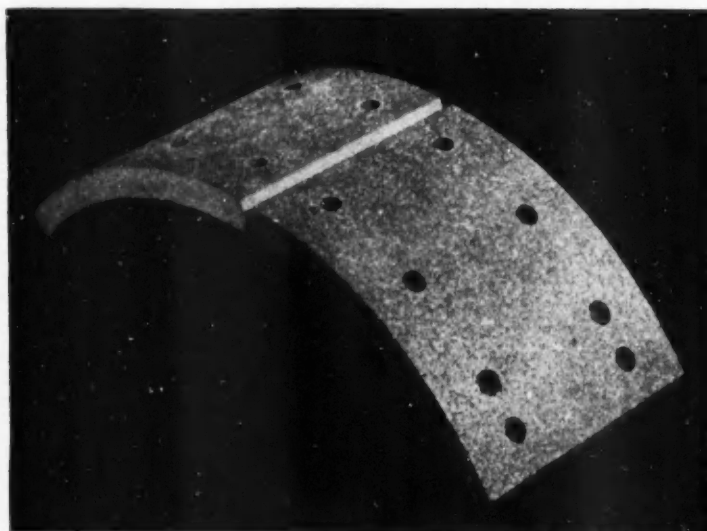
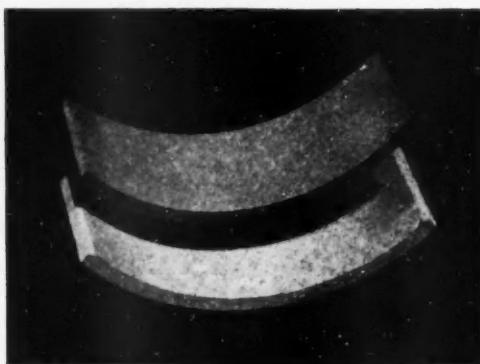
Chicago: 64 E. Jackson Boulevard

ALUMINUM PERMANENT MOLD AND SAND CASTINGS . . . HARDENED, GROUND AND FORGED STEEL PARTS

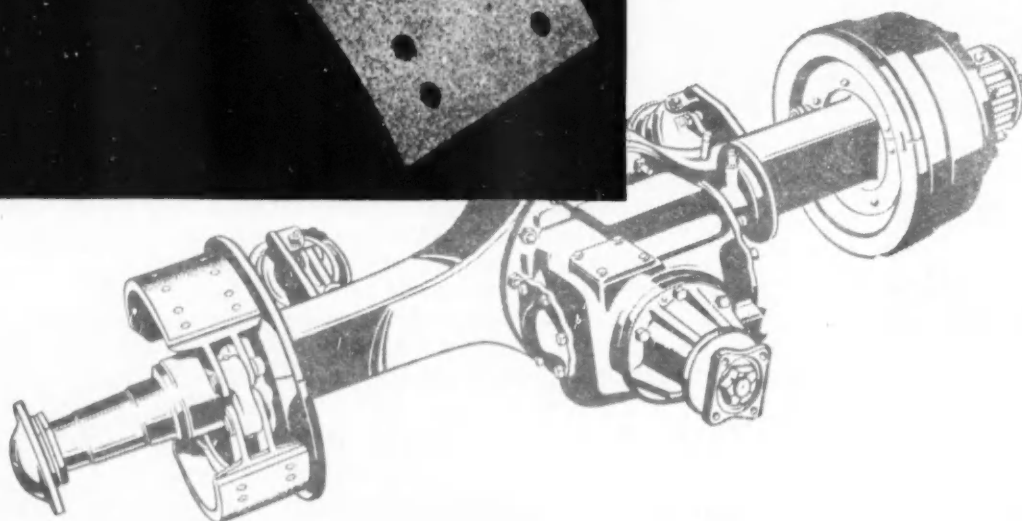
AUTOMOTIVE INDUSTRIES, October 1, 1953



This handbrake is a marvel of mechanical simplicity. It gives maximum efficiency with minimum maintenance. The two opposing brake shoes are lined with an R/M high friction lining, M-2761, and an R/M low friction lining, M-2541. The combination means dependability over a long period of time.



This wheel brake is part of an axle unit designed to be the lowest in weight available today in relation to load-carrying capacity. Two entirely different types of $\frac{3}{4}$ " brake blocks made by R/M are combined to provide the safe, efficient stopping every operator wants.



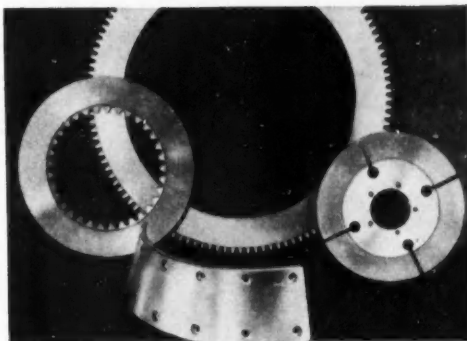
THE TRADE-MARK THAT SPELLS PROGRESS IN FRICTION MATERIAL DEVELOPMENT!

Ever since the day, more than 50 years ago, that R/M developed the first asbestos brake lining, Raybestos-Manhattan has set the pace for automotive friction materials. Year after year it has anticipated engineering needs and been ready with advanced-design materials. Its leadership today is evidenced by the fact that more trucks, buses and cars use R/M brake linings, brake blocks, clutch facings and automatic transmission parts than any other make.

But the automotive industry is only an example of the fields which the R/M Corporation serves in a large way. Equipment manufacturers in general count on R/M to meet every advance in their progress. It is true of the makers of construction equipment, of mining equipment, of office equipment, etc.

R/M achieves its outstanding results by working with countless combinations of different types of friction materials... including woven and molded asbestos, semimetallic

materials, and sintered metal parts. If you have a friction material problem, call in your R/M representative. Get the advantage of R/M's years of know-how, its seven great plants, their research departments and their testing laboratories.



The need for sintered metal parts is on the increase, especially where applications call for close tolerances or operating conditions require immersion in oil. R/M's production is keeping pace with industry's need for these parts.

Write for your copy of the R/M Engineering Bulletin. It describes and illustrates many R/M friction materials for aviation, agriculture, the automotive industry and others.

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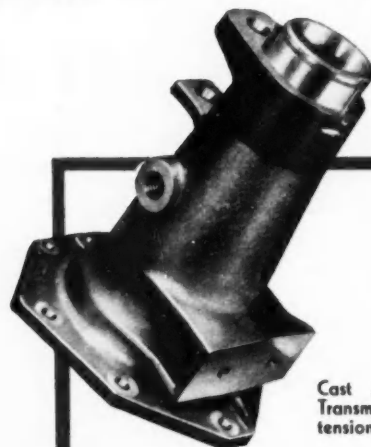
RAYBESTOS-MANHATTAN, INC., Manufacturers of Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Industrial Rubber Products • Rubber Covered Equipment • Packings • Teflon Products • Asbestos Textiles • Sintered Metal Products • Abrasive and Diamond Wheels • Bowling Balls



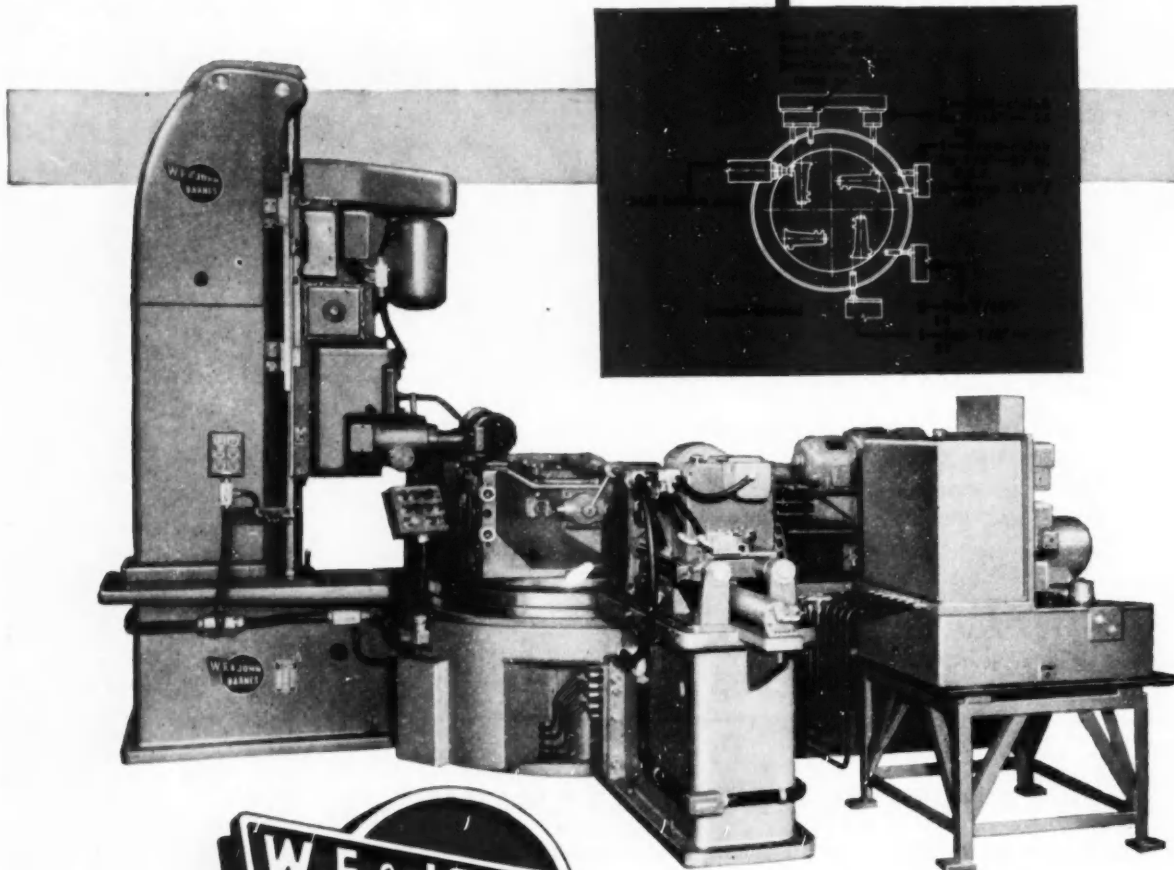
118 Pieces per hour 35 Operations...

TRANSMISSION EXTENSIONS MACHINED TO CLOSE TOLERANCES ON COMPANION UNITS

Here is another typical example of how W. F. & John Barnes coordinated special machine engineering and building service helps solve complex machining problems. These two companion units, designed to machine cast aluminum automobile transmission extension housings, reduce production costs by combining operations. Note how the parts are positioned and the tooling arranged for efficient machining, and how the over-all design conserves floor space. The two machines perform 35 operations at the required gross production rate of 118 pieces per hour. Whether your production requires large or small machines, you'll find the coordinated services at Barnes can help you solve problems quickly and efficiently.



Cast Aluminum
Transmission Ex-
tension Housing

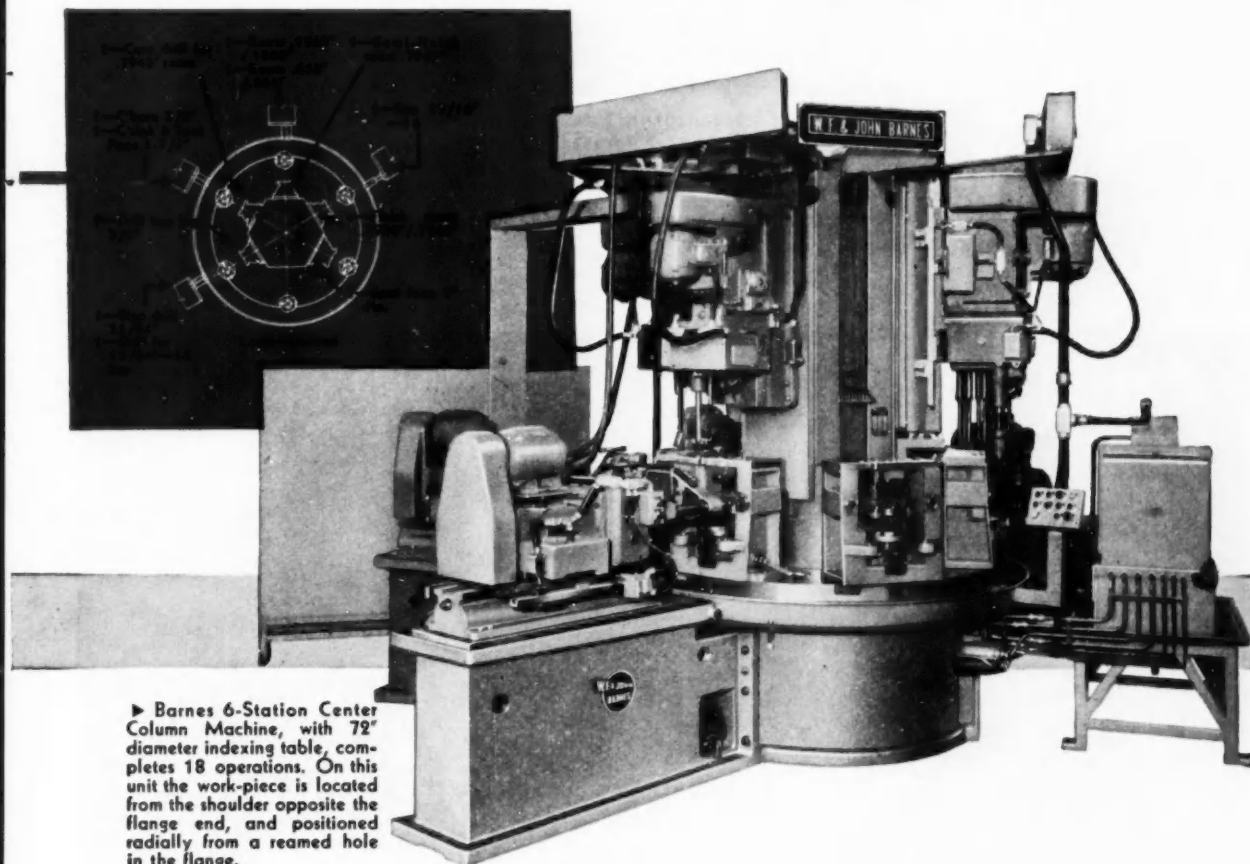


Barnes 4-Station Special Machine with 48" diameter hydraulically operated rotating table. This unit performs 17 operations. Vertical milling of bottom pad in Station No. 2 is completed with a retracting spindle. Fixtures locate part on end bores.

MULTIPLE SPINDLE

W. F. & JOHN BARNES COMPANY
DRILLING • BORING • TAPPING MACHINES

...ON W. F. & JOHN BARNES SPECIAL MACHINES



► Barnes 6-Station Center Column Machine, with 72" diameter indexing table, completes 18 operations. On this unit the work-piece is located from the shoulder opposite the flange end, and positioned radially from a reamed hole in the flange.

BARNES SPECIAL MACHINE TOOL BUILDING SERVICE INCLUDES

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|--|---|
| <p>1 SPECIALIZED MANUFACTURING FACILITIES—75-year background, large well equipped plant efficiently tooled to produce high production machines.</p> | <p>4 SPECIAL GAUGES, FIXTURES, TOOLS—designed for each individual machining problem, assure accuracy of operations at high production speeds.</p> |
| <p>2 SPECIAL HYDRAULIC EQUIPMENT—designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.</p> | <p>5 SPECIAL HANDLING AND CONVEYOR EQUIPMENT—designed and built to reduce work handling, effect maximum safety and efficiency.</p> |
| <p>3 SPECIAL ELECTRICAL EQUIPMENT and CONTROLS—individually designed and built for maximum safety and ease of control with circuits that assure the most dependable coordination of all machine functions.</p> | <p>6 COORDINATED DESIGN AND ENGINEERING—Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work solves complex problems quickly.</p> |

Write FOR FREE DATA

"Coordinated Machine Engineering" — a free booklet describing modern machines and mass production techniques. Write for your copy today.



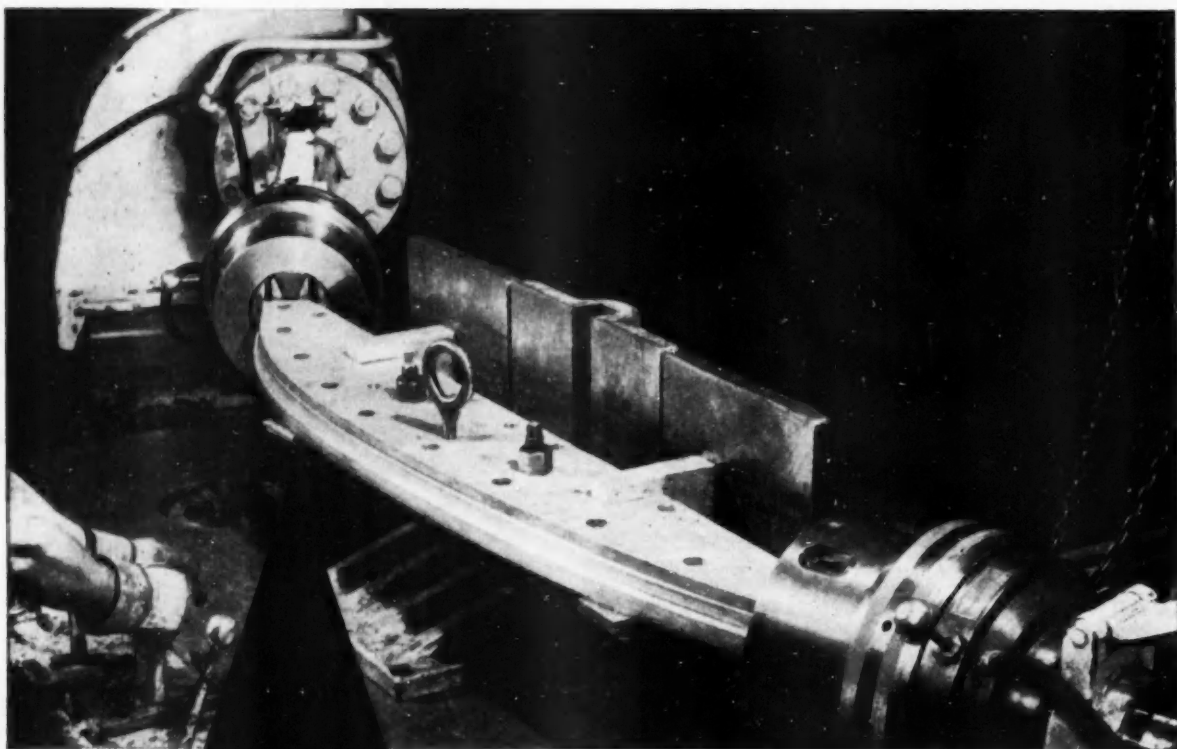
312 S. WATER ST., ROCKFORD, ILLINOIS

AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

AUTOMOTIVE INDUSTRIES, October 1, 1953

This stretch forming die is aluminum (Alcoa Aluminum Tool & Jig Plate) because aluminum dies are lighter, easier to handle, faster to machine and cost less to make than those of steel. Many manufacturers are using Alcoa Tool & Jig Plate for assembly and machining fixtures, dies for low-pressure molding of rubber and plastic, and dies like this one which form aluminum sheet.

Alcoa Tool & Jig Plate is a cast product, fully normalized and strain relieved. It is available from stock in thicknesses of $\frac{3}{8}$ " to 4" and in dimensions up to 48" x 96". For full information on Alcoa Tool & Jig Plate, contact your local Alcoa sales office . . . or write Aluminum Company of America, 1951-K Alcoa Building, Pittsburgh 19, Pa.



This
Stretch
Forming
Die is
Aluminum

Alcoa 
Aluminum
ALUMINUM COMPANY OF AMERICA

In Industry after Industry

YALE

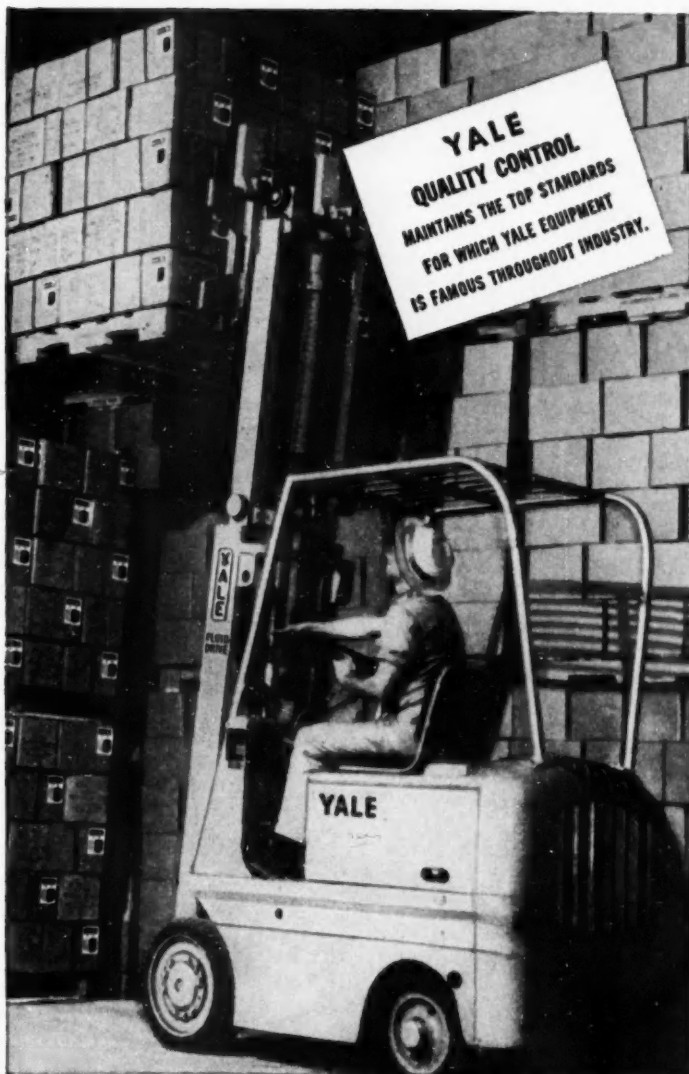
sets the pace

Give this great YALE truck every test you know. Run it fully loaded on ramps, indoors and out. See the power it delivers... the fuel economy it gives. Let operators test it for smoothness...for maneuverability... for safety...and you'll see why it's the standout truck of this or any other year.

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- 3 Automotive Type Brakes with extra braking surface
- 4 Shockless steering...for greater operating ease and safety
- 5 Hypoid Gears oil-sealed against dirt and dust, give drive 30% more strength against shock loads

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Whatever type of truck will serve you best—Gas, Electric or Diesel powered—you'll find it in YALE's comprehensive line.

Also ask for full information on the numerous attachments Yale makes available for special handling problems.

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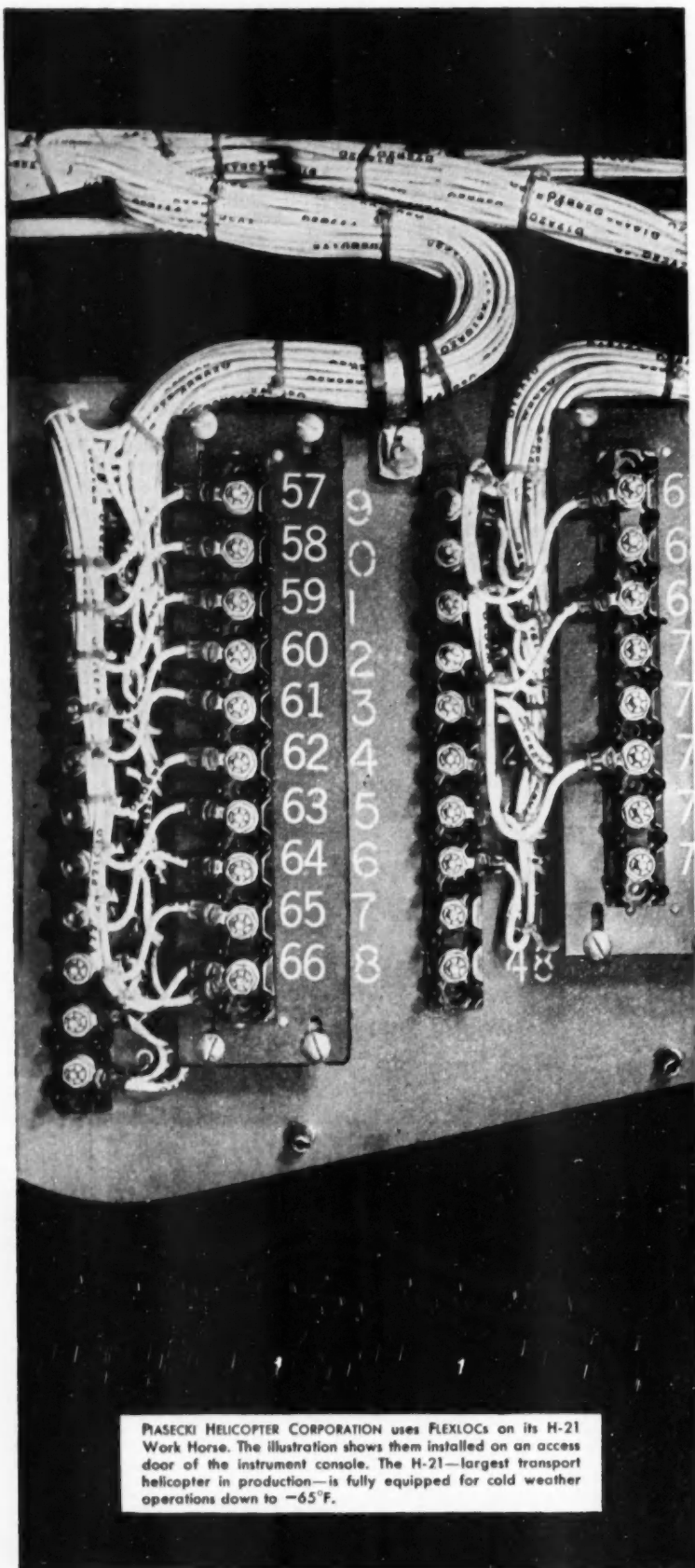
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Name _____ Title _____

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Gas, Electric, Diesel Lift Trucks • Worksavers • Hand Trucks • Hand and Electric Hoists • Pul-Lifts



PIASECKI HELICOPTER CORPORATION uses FLEXLOCs on its H-21 Work Horse. The illustration shows them installed on an access door of the instrument console. The H-21—largest transport helicopter in production—is fully equipped for cold weather operations down to -65°F.



Why use **FLEXLOC** locknuts?

The answer is simple. They hold assemblies together, and won't work loose like ordinary nuts. Once you install these one piece, all metal nuts, you can forget them. Yet they can be easily removed and can be reused again and again.

No fastening job is too tough for a FLEXLOC. Whether it's on an access door of a Piasecki Helicopter or the picker stick of a high speed loom, a FLEXLOC stays put.

FLEXLOCs save production and maintenance time. They are one piece, all metal—nothing to assemble, come apart, lose or forget. Standard FLEXLOCs have higher tensile than most other nuts—and because they are all metal, are not affected by temperatures to 550°F.

SPS can deliver any quantity of FLEXLOCs in a wide range of sizes. Stocks are carried by industrial distributors. Write for literature and samples. SPS, Jenkintown 53, Pa.

FLEXLOC

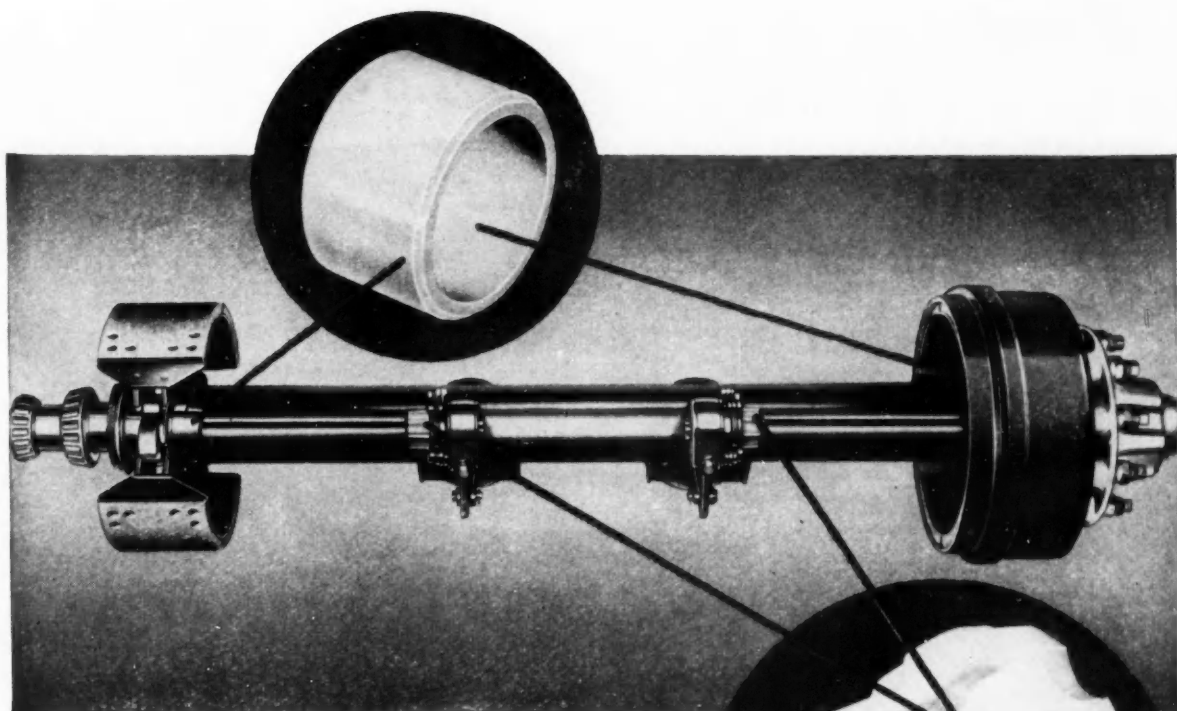
LOCKNUT DIVISION

SPS

JENKINTOWN PENNSYLVANIA

Our Fiftieth Year : A START FOR THE FUTURE

AUTOMOTIVE INDUSTRIES, October 1, 1953



Bushings of **DU PONT NYLON** resist rust and corrosion ...reduce brake camshaft wear

After testing many materials, The Timken-Detroit Axle Company has now standardized on molded DuPont nylon bushings in truck brake camshaft assemblies. Results of both laboratory and field tests reveal that molded nylon bushings have superior wearing qualities. They never rust or corrode. Camshaft journal wear is minimized even when the nylon bushings are not lubricated because of neglect—or are lubricated improperly. Galling and brinnelling of the brake camshaft have been completely eliminated by the application of nylon bushings. And the resilient nylon bushings do not flatten out after high mileage.

Parts molded of Du Pont nylon are tough, lightweight, dimensionally stable. They are unaffected by continuous operation to 250°F. And through mass production by injection molding, production costs are often lowered and assemblies simplified.

Forward-looking automotive engineers are finding that the unique properties of Du Pont nylon are making possible many of their ideas for improved design and performance. Perhaps these properties can help blueprint your development program. For further information on Du Pont nylon plastics, write: E. I. du Pont de Nemours & Co. (Inc.),

Polychemicals Dept., Room 17L10,
Du Pont Bldg., Wilmington 98, Del.

Nylon bushings molded for
The Timken-Detroit Axle Co., Detroit, Mich.,
by St. Clair Plastics Corp., Marine City, Mich.

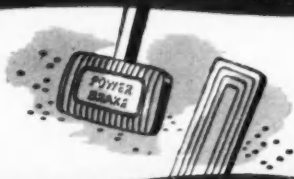


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BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

Polychemicals
DEPARTMENT
PLASTICS • CHEMICALS

Bendix the only performance **PROVEN**
Low Pedal Power Brake



Now a **PROVEN** sales producer
for leading car manufacturers



Specified by More Car Manufacturers Than Any Other Make

The car buying public has been quick to recognize that the Bendix* Low Pedal Power Brake is not only a most desirable new car feature, but that its effortless, quick and positive braking actually is a revolutionary advancement in motor car control. Thus, the car manufacturer offering his customers this advanced feature has a decided advantage over competition.

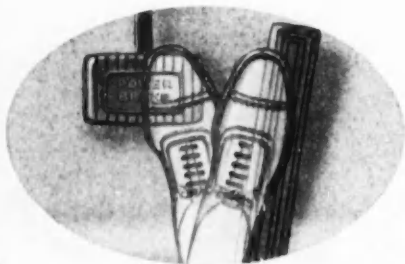
That this is an established fact and not a theory is unmistakably proven by the ever increasing percent of car buyers specifying the Bendix Low Pedal Power Brake on cars offering it as optional equipment... tangible evidence that the Bendix Low Pedal Power Brake is one of the most popular devices offered the public in years.

This greatest improvement in braking since four wheel brakes is unique in many ways. It is, for example, the only low pedal power brake that has met the test of millions of miles under all operating conditions. In fact, Bendix Low Pedal Power Brake is specified by more manufacturers than any other make. Remember, too, this new low pedal power brake is the product of Bendix—world's largest producer of power brakes and leader in braking developments since the earliest days of the industry.

For any car manufacturer interested in adding a big plus to his sales story, the Bendix Low Pedal Power Brake is the answer.

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NOW *Stopping*
IS AS EASY AS *accelerating*



It is no longer necessary to lift the foot and exert leg power pressure to bring your car to a stop. With the Bendix Low Pedal Power Brake on about the same level as the accelerator, an easy ankle movement, much like working the accelerator, is all the physical effort required for braking. And by merely pivoting the foot on the heel, shifts from "go" to "stop" controls are made in far less time.

Result! MORE DRIVING COMFORT,
LESS FATIGUE AND GREATER SAFETY

Bendix
Products
Division

BENDIX PRODUCTS DIVISION SOUTH BEND

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High Spots of This Issue

★ Starting Jet Engines with Turbo-Compressor

Rapid progress has been made in the development of pneumatic starters for jet engines, but air compressors have not kept pace with them. The French Palouste turbo-compressor, described here, seems to offer a solution. See Page 50.

★ Amazing Recovery from Hydra-Matic Fire

This is the epic story of a mighty catastrophe whose victims refused to be beaten by it. What General Motors has done to get back into production of Hydra-Matics after the disastrous Livonia fire is graphically told. Page 54.

★ New British Planes Reach Production Stage

Long an acknowledged leader in the aviation world, Great Britain showed that it is still surging ahead at the recent Farnborough Exhibition. The latest developments in both planes and engines are discussed in detail. Page 60.

★ Russia's Strength Today

During the past few years the Russian Bear has been working hard at building up his military and industrial sinews. In many areas, according to the author's analysis, he is succeeding, but there still remain many soft spots. Page 62.

★ Automation Applied to Engine Balancing Equipment

The reader who joins this written tour of the De Soto engine plant will marvel at the way in which automatic handling of engines is combined with automatic balancing. Once more the science of automation achieves resounding success. Page 70.

★ 30 New Product Items And Other High Spots, Such As:

Automatic stamping and welding of sheet metal parts; timely tractor problems analyzed at SAE meeting; helicopter rotor hub features unique construction; legal codes affecting car air conditioning need to be modernized; Powerglide governor gears produced by advanced methods; and sulphur surface treatment increases wear resistance.

Automotive and Aviation News, Page 33

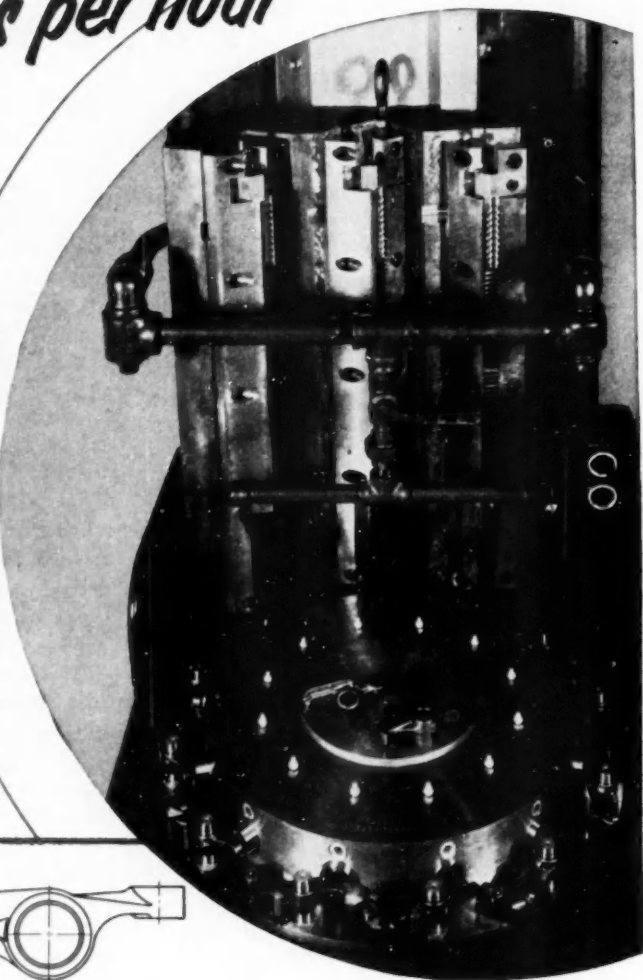
Complete Table of Contents, Page 3

Hydro-Broaching with Rotary Index Fixture

Nets 1550 parts per hour

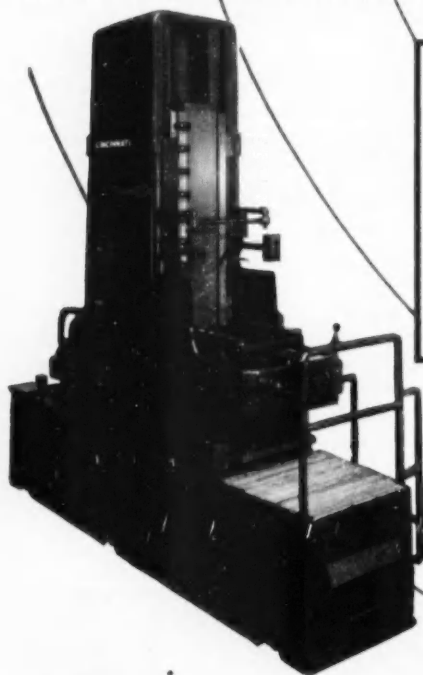
The equipment illustrated here is highly productive because it's largely automatic. The operator merely removes the broached parts and reloads the fixture as it automatically indexes in front of him. 1550 parts are broached per hour. ¶To attain this high rate of production, Cincinnati Application Engineers tooled up a CINCINNATI No. 5-42 Single Ram Vertical Hydro-Broach Machine with a three unit broach holder, for broaching three parts each stroke of the ram. The machine table is replaced with a hydraulic index fixture which holds twelve parts. Clamping is automatic. The operating cycle repeats continuously: broach three parts, index 31°, return ram, index 59°. This equipment is a high production, low-cost installation, safe and easy to operate. ¶Although CINCINNATI Hydro-Broach Machines are in short supply at this time, you might like to know more about their application. Write for publication M-1559-1. It contains many examples of low-cost broaching setups.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO



Drawing of part. Heavy line indicates broached surface. Production data:

| | |
|------------------|--|
| Part Name . . . | Valve rocker arm |
| Material . . . | Steel forging |
| Operation . . . | Broach convex pad |
| Production . . . | 1550 per hour |
| Equipment . . . | CINCINNATI No. 5-42 Single Ram Vertical Hydro-Broach Machine with built-in automatic fixture |



CINCINNATI No. 10-66 Single Ram Vertical Hydro-Broach Machine. Nos. 5-42, 5-54 and 10-54 sizes also available. Write for new catalog No. M-1745.



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OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 109, No. 7

OCTOBER 1, 1953



NEW SMALL STANDARD "EIGHT"

Production of this new competitor of the Austin "Seven" and small Ford is beginning at Coventry by the Standard Co. The four-cyl engine has overhead valves, iron head and chrome iron block, compression ratio of 7.25 to 1. Output is 26 hp at 4500 rpm. Bore and stroke are 2.28 and 2.99 in., for displacement of 49 cu in. Features include pressure lubrication, by-pass filter, hydraulically operated clutch, unitized body construction, folding rear seat for extra luggage space.

GM Awarded Tank Job, Shares Truck Order

Fisher Body Div. has been designated successful bidder to be sole producer of M-48 medium tanks at Grand Blanc, Mich., under the new single source policy of the Defense Dept. Fisher underbid Chrysler Corp., which has been making the tank at its Newark, N. J. and Centerline, Mich. plants, by 12 per cent. The contract involves about \$200 million. Fisher would also build the T-43 heavy tank if required. Chrysler had built a few at Newark, with the M-48. Both contracts run out in April 1954.

In its decision on 2½ ton 6 x 6 military trucks, the Defense Dept. deviated from its one source policy by assigning manufacture to GMC Truck & Coach Div. and Reo. Reason given was that both companies already are producing trucks and that although GM's bid was a little lower, both companies would stay in production to "maintain a broader produc-

tion base and reduce delivery rates."

Under new contracts, General Motors will get \$85 million worth of trucks, with Reo awarded \$61 million worth.

Chrysler is expected to receive a \$50 million contract for a new type vehicle to be built at the Centerline tank plant about the first of next year. There is speculation that the vehicle referred to may be the T-51, a heavy tank recovery unit. Early this year it had been announced that Chrysler would build the T-51 but no action was taken following the general cutbacks last July. The company also has a separate design contract for the M-48 tank.

Olds, Cadillac Plan No Dynaflo Option

There has been considerable speculation as to whether Oldsmobile and Cadillac might possibly offer Dynaflo transmissions as an option after Hydra-Matic drives again are available in ample quantity, but at the moment both divisions apparently

Hydra-Matic Output to Resume Soon

Indications are strong that General Motors Corp. will get into limited production of Hydra-Matic transmissions again at its Riopelle Plant in Detroit by the middle of this month or before. These units will be assembled from components farmed out to subcontractors across the country, including General Motors divisions. The subcontracting operation is designed to bridge the gap until output can start at Willow Run early in November, with full production of 200 units an hour expected by the middle of December.

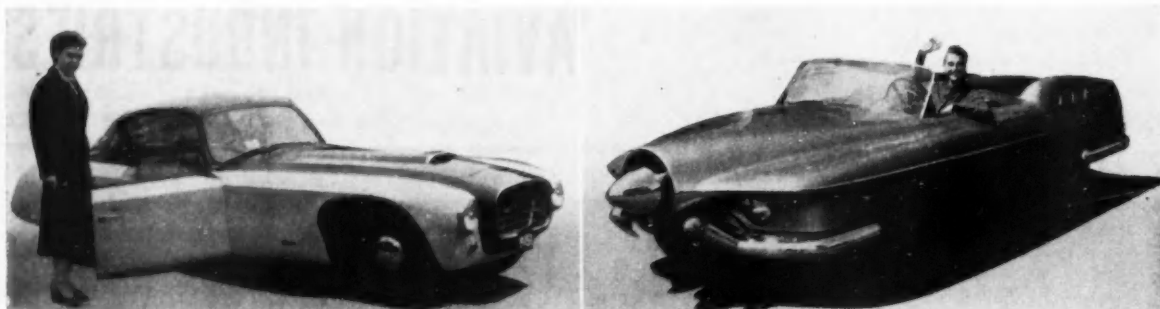
Ford, Plymouth Mark Production Totals

Two companies marked historic production milestones during September. Ford commemorated production of its 40 millionth vehicle in U. S. plants on Sept. 9, just 50 years and 85 days after the company started production. Ford noted that it required 12 years to build the first one million vehicles, but during the next six years four million more cars were produced. Total Ford production from U. S. and foreign plants, and including trucks, tractors and military vehicles, exceeds 45 million units.

Plymouth marked production of its eight millionth car 25 years and three months after the first unit was produced in 1928. More than half still are in active service.

have no such plans. Oldsmobile will be able to obtain Dynaflo transmissions for less than 45 per cent of its planned production during the remainder of this year. The balance of the output will be with manually shifted synchromesh transmissions and presumably whatever Hydra-Matic drives are available.

News of the AUTOMOTIVE



United Press

SPORT STYLING, PRESENT AND FUTURE

An aluminum body has been added to an English Morgan chassis by a Belgian coachwork firm, left. The leather-upholstered two-seater is designed for comfort and speed, and weighs about 1650

lb empty. The California-styled Manta Ray exhibited at the National Hot Rod and Motor Sports Show in Los Angeles last month has fiber glass dash, scoop-type grille and three rear fins.

Two Makers Expanding Cleveland Facilities

Chevrolet is expanding its Cleveland manufacturing plant by approximately 160,000 sq ft. Four major projects are included in the program: a 72,000 sq ft addition to the pressed metal section, a new scrap baler house; a 30,000 sq ft addition to present office space and a dock extension measuring 135 x 400 feet. The plant provides metal stampings, service parts, Powerglide automatic transmissions, and aviation engine parts and subassemblies.

Ford will build a new stamping plant at Walton Hills, O. near Cleveland. The new unit, located on a 116 acre site, will add 960,000 sq ft of floor space and will supplement Ford's other stamping plants at Buffalo, N. Y. and Dearborn, Mich. It will have 15 major press lines to produce body parts and assemblies for Ford and Mercury cars. The new plant will be even more highly mechanized for materials handling than the Ford Buffalo Stamping plant which opened in 1950. The Buffalo plant is being expanded to add two more major press lines, bringing the total there to 21. Many of the automation methods developed there have been improved upon by Ford engineers for installation in the new Cleveland plant. Expansion of the engine facilities was announced last month.

A Ford spokesman recently pointed out that the company from 1946 to 1952 spent \$500 million for expansion

and modernization of its plants, with \$500 million additional set for new plants in the next five years. Ray Sullivan, vice-president for engine and foundry, metal stamping and parts and equipment manufacturing, added that increases in Ford output of certain electrical equipment recently was the first step in plans to greater integration.

Hardtop Convertible Popularity Climbs

Popularity of the hardtop convertible continues to grow. Buick reports that its production of that model this year will more than double that of the previous high year, 1951. Buick estimates that it will turn out 175,000 hardtop convertibles in 1953. During the first eight months of this year nearly 35 per cent of total production was represented by hardtops, an increase of nine per cent over last year.

Plymouth to Build Own Coupe Bodies

Plymouth is preparing to build bodies for club coupes and three-passenger coupes at its Evansville, Ind., plant in space released by completion of defense work there. Work is already under way in clearing the plant and installing facilities for the body job. Stampings will be shipped from Detroit, with the Evansville operation to be complete from framing to paint and trim.

GM Opens Service Training Center

The first of 35 service training centers to be set up across the country within the next year was opened by General Motors at Detroit. It has 45,000 sq ft of floor space and contains eight shop-classrooms for training dealer mechanics from each of the five car divisions as well as from GMC Truck and Coach, United Motors Service, and Fisher Body Divs. In addition, an auditorium and large meeting rooms are available for service classes or other uses. More than 500 mechanics can be trained at one time, with about 5000 expected the first year. Construction has started at three other locations: Parma, O. near Cleveland; Dedham, Mass. adjacent to Boston, and Union, N. J.

Ordnance Cuts Dodge, Willys Truck Orders

Army Ordnance has put into effect some rather stiff cuts in purchases of military trucks and jeeps from Dodge and Willys. Starting next January, deliveries of $\frac{3}{4}$ -ton trucks and ambulances produced by Dodge will be cut from \$5 million a month to \$3.15 million. An even larger percentage cut will go into effect at Willys, where the monthly rate will be cut from \$6 million to \$2.8 million for Jeeps. Studebaker completed its military contract for $2\frac{1}{2}$ -ton 6 x 6 trucks late in August.

AND AVIATION INDUSTRIES

Five Car Makers Hit by Jet Engine Cut

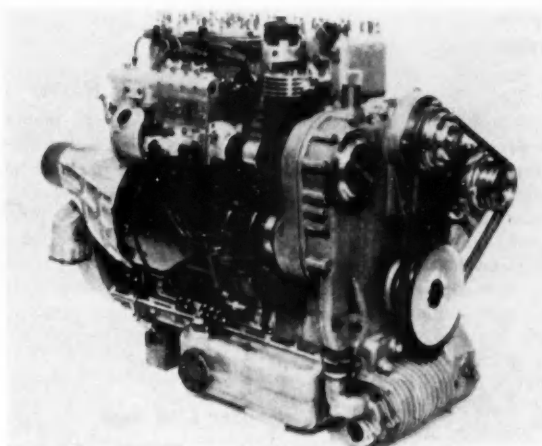
Studebaker, Packard, Buick, Nash, and Chevrolet will feel most of the effects of the sizeable cutbacks announced by the Air Force in aircraft engine orders. These companies are secondary producers. Practically all types of engines except the Pratt and Whitney J-57 are affected by the cutback, including the J-47, Allison J-33, Curtiss-Wright J-65, R-2800, and R-3350. Under the program Studebaker producing J-47 at South Bend, Buick turning out the J-65 at Chicago, Packard making the J-47 at Detroit, Nash building the R-2800 at Kenosha and Chevrolet producing the R-3350 at Tonawanda, N. Y., will go out of production much earlier than originally planned, with some of them finishing up by next spring.

Buick, which produces the J-65, will not feel cutbacks as early as other producers because production still falls short of Air Force needs. Ford also will not be as seriously affected, since it already is preparing to produce the J-57 as soon as its piston engine contract is finished. Principal reason for the curtailment, according to the Air Force, is that life expectancy is much greater and the accident rate lower than originally estimated.

Sales, Production Keep Pace for Near-Mark

There is little in official new car registration figures to support current pessimism encountered in some quarters on new car sales. According to R. L. Polk, new car registrations for the first seven months of this year totalled 3,413,808 units, which is within 26,000 of the all-time record established in 1950. It also is approximately a million more units than were sold in the same period a year ago. Undoubtedly sales are trending downward in the normal seasonal pattern but the decline is not a severe one and there is every indication that the year as a whole will wind up as the second best sales in history.

Despite several adverse influences, such as General Motors Hydra-Matic plant fire, long shutdowns by some



New 10,000-Lb Jet

Types of jet engines which the Air Force plans to install in some of its newest fighters have been revealed by a Washington slip-up. One of the power plants involved is the J-71 jet, intended for use in the F-105, the replacement for the F-84. The J-71 reportedly has a thrust rating of about 10,000 lb—almost twice that of U. S. engines in current use. In modified form, it will power the new B-66 reconnaissance bomber.

The Navy and the Westinghouse Electric Corp. have announced that

Westinghouse has developed and placed in production a new high-power, low-weight turbojet aircraft engine known as the J46. Output of the one-ton engine was not announced.

The J46 engine will be first used in the F7U-3 Cutlass. Earlier versions of the Cutlass were flown with two Westinghouse J34 engines. Westinghouse will discontinue further development work on advanced models of the J40 engine. Production of the current model J40, which is now being manufactured at Westinghouse's jet plant in Kansas City, Mo., will continue.

Bohn Wants Press

Bohn Aluminum & Brass Corp., has confirmed the report that it has requested of the Air Force the installation of a new 8000-ton or 12,000-ton extrusion press for the Bohn Adrian, Mich., plant No. 24. This plant is currently leased from the Air Force.

ard, Chrysler divisions, and possibly Kaiser either coming back into production or increasing output, a total of 6.4 million is a likely prospect.

Installment credit buying of automobiles is in a healthy position according to figures of the NADA. Amount of auto installment credit outstanding in relation to the retail value of cars registered at the end of 1952 was 13.9 per cent, compared to 18.0 in 1940 and 16.2 in 1941.

NEW DIESEL

This loop - scavenged two - cycle aluminum Diesel engine is under development by the Swiss Saurer concern. A rotary valve in the exhaust keeps the ports closed during compression after inlet ports are closed. An improved design of 4 3/4 in. by 5 1/2 in. is said to give 180 hp at 2000 rpm, 0.465 hp per cu. in.

News of the AUTOMOTIVE

Interiors Brighter on 1954 Models

Much more emphasis on quality of upholstery fabrics and wider use of color will be noticeable on 1954 models. Particularly in evidence will be the increased matching of interior and exterior colors, a trend which has been growing for the last couple of years. Not only are the grays of former years being displaced in upholstery material, but new fabrics and plastics are being used which may have an effect on seat cover sales, since some of the fabrics combine the high wear and easy cleaning qualities normally found in seat cover material. Much more pleating and high luster metal moldings also are in evidence.

Highway Building Costs Declining

Costs of building highways are declining after a steady increase since 1949, according to Bureau of Public Roads. The Bureau reports that highway construction costs during the second quarter of this year showed a substantial decline from the first quarter. The price drop is welcome news to the automotive industry, which is vigorously behind the cam-

paign to modernize the nation's highway system.

Mobile Home Sales Higher

Manufacturers sales of mobile homes set another record for the first six months of this year as volume rose 3.7 per cent. Total value of manufacturers sales at the retail price was \$159,508,350, the Trailer Coach Manufacturers Association reported. Unit production of 41,171 homes in the 1953 period was up three per cent. Repeat buying was credited for the continued brisk demand.

Filter Line Sold

Titeflex, Inc., announces the sale of the design and manufacturing rights of the industrial filter for the electroplating market to Wagner Bros., Inc., Detroit distributors of filtration and automatic equipment to the electroplating industry. Titeflex still retains the design and manufacturing rights of its filters for the chemical and other industries. Titeflex, Inc. is a leading metal hose manufacturer and also produces a wide range of aviation components including electrical connectors, ignition harnesses, flexible and rigid waveguides, precision bellows, and wiring systems.

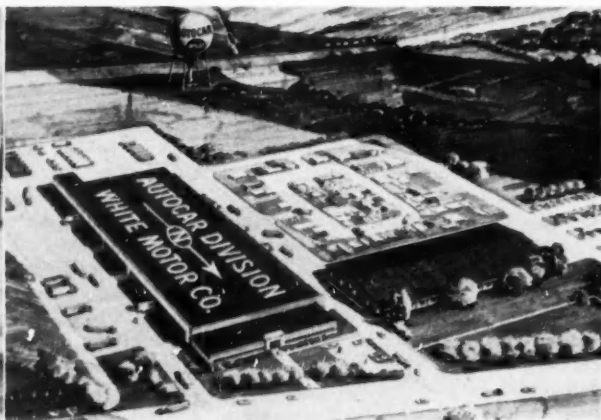
Motor Products, Timken Show Gain in '53

Motor Products Corp. has reported earnings for the fiscal year ending June 30 at slightly more than \$3.1 million. For the same period a year ago profit was approximately \$2.8 million. Income tax liability for the past year was \$3.6 million, or approximately one-half million dollars more than earnings.

Earnings and sales of Timken-Detroit Axle Co. for the fiscal year ended last June 30 showed a substantial increase, according to the company's report. Net earnings for the year totalled more than \$7.24 million on sales of more than \$236 million. This compares with the previous fiscal year earnings of \$6.8 million and sales of \$233.3 million.

Fuller Mfg. Buys Shuler Axle Co.

Fuller Manufacturing Co. of Kalamazoo, Mich., has acquired control of Shuler Axle Co. of Louisville, Ky. Fuller has acquired all capital stock of Shuler which it will operate as a wholly owned subsidiary. Shuler produces front axles for heavy vehicles and tubular, square, and I-beam rear trailer axles.



MODERN PLANTS FOR ENGINE AND TRUCK BUILDING

Two new buildings are being added to the facilities of Continental Aviation & Engineering Corp. at Detroit. The left two-story structure will garage 60 cars in addition to offices on the first floor, with engineering and drafting rooms above. The two-story steel frame addition, with glass and aluminum walls, will be devoted to manu-

facturing and research. Total area added will be 50,000 sq. ft. At the Exton, Pa., site of the new Autocar plant, work began on the 130,000 sq ft factory last month. R. F. Black, president of the parent White Motor Co., announced that White engines will be used by Autocar, and that he expects production to increase at Exton.

AND AVIATION INDUSTRIES

Steel Capacity Ratio Dips, but Output Up

One factor sometimes overlooked in reporting the nation's steel output as per cent of capacity is that a lower percentage figure today may still mean more actual steel produced than a higher percentage a year ago because of still increasing capacity. During one recent week mills operated at 95.2 per cent of capacity compared with 100.8 per cent a year earlier. However, output during the particular week this year amounted to 2,146,000 tons compared with 2,093,000 tons a year earlier when per cent of capacity was 5.6 per cent higher.

Harvester Earnings Show Small Rise

International Harvester reports a small rise in sales for the first nine months of fiscal 1953 and also a slight increase in profits. Sales for the period totaled \$999,764,000 compared with \$981,473,000 for the same period a year ago. Earnings for the first three quarters of the year totalled \$38,517,000 compared with \$38,442,000 during the same period of last year.

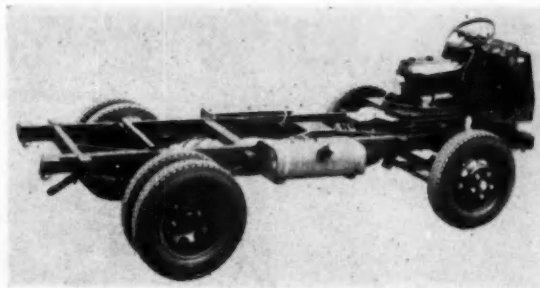
Canadian Shipments, Sales

Vehicle shipments from Canadian automobile plants in July continued well ahead of last year's output, the Bureau of Statistics reported. Shipments during the month totaled 48,691 units, compared with 34,314 in July of last year and brought the total in the first seven months of the year to 332,389 as against 265,911 a year earlier.

Sales of new motor vehicles continued an upward trend during July. A total of 42,789 new vehicles sold for \$106,578,048 during the month compared with 38,133 selling for \$94,224,454 in July, 1952. Of these, new passenger cars—34,509 valued at \$85,718,656 against 29,262 at \$71,049,188 last year—accounted for the over-all increase.

United Name Changed

The stockholders of United Stove Co. voted to change the company's



ITALIAN LORRY

The new Italian OM 2 1/2-ton truck uses a Saurer - license Diesel of 54 hp at 2100 rpm. With five speeds forward the truck at five tons gross cruises at 45 mph.

name to United Metal Craft Co. The firm at Ypsilanti, Mich., is a subsidiary of Gar Wood Industries, Inc., Wayne, Mich. It is now producing custom stampings, components and assemblies for the automotive and appliance industries, a rubber-metal mudguard for trucks, and automotive hydraulic truck equipment marketed by National Lift Co., another Gar Wood subsidiary. United is also commencing fabrication of a line of metal household products.

D'Angelo Resigns

Horace D'Angelo has resigned as executive vice-president and general manager of Harry Ferguson, Inc., effective Oct. 15. No reason was given for the resignation other than

Mr. D'Angelo's letter stating that with consolidation of Ferguson with Massey-Harris nearly completed, he could carry out his personal plans. He has been associated with Ferguson since 1940 and has been executive vice-president since 1946.

Ford Names Scientist

Dr. Michael Ference, Jr. has been named chief scientist of its engineering staff's scientific laboratory. A nationally known physicist, Dr. Ference previously has been chief scientist and technical director of the Evans Laboratory at Belmar, N. J., operated by the Army Signal Corps. In his new post he will supervise research in the fields of physics, electronics, fluid dynamics, and radiation.

1953 NEW TRUCK REGISTRATIONS

Arranged by Makes in Descending Order According to the 1953 Seven Months' Totals

| MAKE | SEVEN MONTHS | | | | Units | | Per Cent of Total | | |
|-----------------|--------------|--------|-----------|---------|---------|--------|-------------------|------|------|
| | July 1953 | | June 1953 | | 1953 | | 1952 | | |
| | 1953 | 1952 | 1953 | 1952 | 1953 | 1952 | 1953 | 1952 | 1952 |
| Chevrolet | 27,782 | 28,801 | 22,908 | 201,374 | 157,114 | 36.49 | 33.34 | | |
| Ford | 20,041 | 19,255 | 15,301 | 135,822 | 106,870 | 24.99 | 22.66 | | |
| International | 7,950 | 8,311 | 8,756 | 60,853 | 53,661 | 11.03 | 11.39 | | |
| Dodge | 6,467 | 6,695 | 10,169 | 53,131 | 57,517 | 9.63 | 12.21 | | |
| G.M.C. | 7,315 | 7,509 | 7,239 | 52,373 | 46,192 | 9.49 | 9.81 | | |
| Studebaker | 1,827 | 2,030 | 2,778 | 15,429 | 17,008 | 2.80 | 3.81 | | |
| White | 1,272 | 1,133 | 990 | 7,651 | 6,680 | 1.39 | 1.42 | | |
| Willis Truck | 618 | 641 | 1,018 | 5,610 | 6,318 | 1.02 | 1.34 | | |
| Willis Jeep | 706 | 793 | 874 | 5,444 | 4,772 | .99 | 1.01 | | |
| Mack | 659 | 580 | 648 | 4,062 | 4,232 | .74 | .90 | | |
| Reo | 332 | 262 | 277 | 2,210 | 1,804 | .40 | .38 | | |
| Diamond T | 303 | 299 | 258 | 2,004 | 2,070 | .36 | .44 | | |
| Divco | 212 | 263 | 206 | 1,441 | 1,730 | .26 | .37 | | |
| Brockway | 185 | 174 | 132 | 1,230 | 834 | .22 | .20 | | |
| Autocar | 125 | 185 | 125 | 1,044 | 924 | .19 | .20 | | |
| Federal | 90 | 114 | 108 | 595 | 500 | .11 | .11 | | |
| Kenworth | 132 | 56 | 50 | 483 | 401 | .09 | .09 | | |
| Pontiac | 51 | 40 | 39 | 284 | 325 | .05 | .07 | | |
| F.W.D. | 39 | 37 | 44 | 212 | 306 | .04 | .06 | | |
| Peterbilt | 17 | 16 | 21 | 94 | 139 | .02 | .03 | | |
| Misc. Domestic | 44 | 22 | 181 | 339 | 1,386 | .06 | .29 | | |
| Misc. Foreign | 16 | 23 | 12 | 160 | 183 | .03 | .04 | | |
| Total—All Makes | 76,161 | 77,199 | 72,134 | 551,645 | 471,086 | 100.00 | 100.00 | | |

* Based on data from R. L. Polk & Co.

News of the AUTOMOTIVE

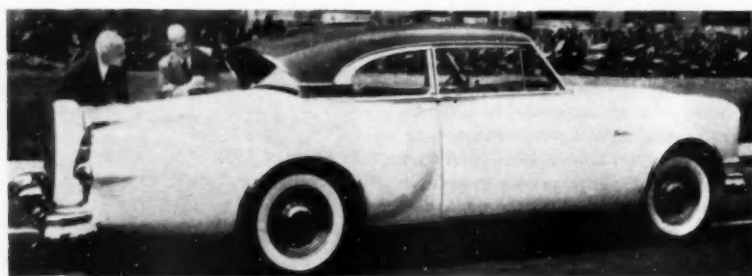
Jet Contracts Revealed

Air Force has ordered America's first twin-engine turboprop military transport planes from Consolidated Vultee Aircraft Corp. The two transports will be model 340 Convair-Liners equipped with General Motors YT-56 Allison gas turbine engines swinging Aeroproducts propellers. Ultimate production versions of the T-56 will develop 3750 equivalent shaft hp each, compared to the 2400-hp piston engines in the commercial versions.

Ryan Aeronautical Co. announced orders from Boeing Airplane Co. in excess of \$2 million for external wing tanks for Boeing KC-97 Stratofreighters. Production of the new aluminum wing tanks is already under way, with deliveries scheduled over the next two years. Factory facilities at Ryan now devoted to manufacture of the larger B-47B tanks will be also available for work on the KC-97 tanks. The first Boeing KC-97 fully equipped with Ford-built engines completed its flight tests recently.

Lockheed Aircraft Corp. has received an Air Force contract to build prototype of the XF-104, an air superiority fighter. The XF-104 will be a piloted jet airplane, designed as an air superiority fighter to establish local superiority in a given area by sweeping the skies of enemy planes. Other details have not been disclosed.

Air Force prime contracts totaling \$8 million are being readied for production by United Aircraft Products, Inc., of Dayton, O. Largest of the contracts, which involve production of accessories for jet engines, is for



REAR WINDOW TREATMENT NOVEL

The Packard Balboa, a hard top convertible with low sports car body, has a vertical rear window. Sun, rain and snow are kept off by roof overhang. Headroom is increased, and package shelf is eliminated.

\$700,000 with the Buick Motor Co., scheduled for production late this year. A second contract, with the Ford Motor Co., calls for tooling up and pilot line production prior to full production on two large items designed for use on jet engines.

Temco Aircraft Corp., which has contracted to produce major assemblies for the Navy F3H-1 jet fighter, will build rear fuselage assemblies for the McDonnell F-101 twin-jet long range fighter.

New Atomic Unit

The General Electric Co. announced the establishment of an Aircraft Nuclear Propulsion Dept. The new department will be engaged in development of an atomic power plant for aircraft and will comprise personnel and facilities of the company's former Aircraft Nuclear Propulsion Project. Headquarters will be at the Evendale plant in Cincinnati, O.

Aeronca Expands

The Aeronca Manufacturing Corp. said it is leasing 30,000 sq ft of manufacturing space in Miamisburg, O., for expanding operation, plus 15,000 sq ft of storage space. Acquisition of the new space will mean employment of some 200 persons in the Miamisburg area. Production there will begin about Jan. 1, 1954. Aeronca, which used to make light aircraft, now turns out components and assemblies for major aircraft concerns.

New Bearing Line

Aluminum Industries, Inc., Cincinnati, O., has taken over distribution of the aftermarket motor bearing business which was formerly serviced by the Bohn Aluminum & Brass Corp. The line of motor bearings became an integral part of the Permite line, and will carry the brand name Permite-Bohn.

REGIONAL SALES OF NEW PASSENGER CARS

| | | Seven Months | | | | | Per Cent Change | | |
|---------------------|--------------------|--------------|--------------|--------------|-----------|-----------|-------------------|------------------------|--------------------------------|
| Zone | Region | July 1953 | June 1953 | July 1952 | 1953 | 1952 | July over June | July over July 1952 | Seven Months 1953 over 1952 |
| 1 | New England | 31,108 | 31,186 | 17,875 | 196,812 | 143,686 | - 0.26 | +77.41 | +38.37 |
| 2 | Middle Atlantic | 109,534 | 110,209 | 70,831 | 853,655 | 474,187 | - 0.61 | +55.06 | +37.85 |
| 3 | South Atlantic | 56,693 | 56,608 | 39,193 | 386,205 | 295,656 | + 4.02 | +50.24 | +30.63 |
| 4 | East North Central | 137,013 | 146,803 | 82,507 | 897,480 | 633,895 | - 7.92 | +66.06 | +41.56 |
| 5 | East South Central | 25,279 | 22,979 | 12,924 | 160,167 | 112,906 | +10.01 | +95.60 | +41.66 |
| 6 | West North Central | 55,666 | 52,597 | 32,993 | 340,844 | 245,251 | + 5.83 | +68.72 | +38.96 |
| 7 | West South Central | 49,153 | 46,937 | 37,134 | 309,077 | 227,244 | + 4.72 | +32.37 | +36.01 |
| 8 | Mountain | 17,381 | 16,381 | 11,585 | 111,940 | 83,613 | + 6.10 | +50.29 | +33.88 |
| 9 | Pacific | 49,766 | 56,494 | 35,972 | 356,628 | 263,911 | -11.91 | +38.35 | +34.75 |
| Total—United States | | 533,783 | 542,193 | 340,454 | 3,413,808 | 2,480,329 | - 1.55 | +56.79 | +37.64 |

States comprising the various regions are:—Zone 1: Conn., Me., Mass., N. H., R. I., Vt.—Zone 2: N. J., N. Y., Pa.—Zone 3: Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va.—Zone 4: Ill., Ind., Mich., Ohio, Wis.—Zone 5: Ala., Ky., Miss., Tenn.

—Zone 6: Iowa, Kan., Minn., Mo., N. D., S. D.—Zone 7: Ark., La., Okla., Tex.—Zone 8: Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.—Zone 9: Cal., Ore., Wash.

AND AVIATION INDUSTRIES

Materials Handling Center Expands

The Materials Management Center at Wayne University in Detroit is entering its second year with the program twice as extensive as that included during the first year's operation. The materials handling program will include 37 courses which can lead to a certificate of attainment in various fields or to a newly created degree in materials handling engineering. Established a year ago under sponsorship of leading Detroit executives, the program started with ten courses and 273 students representing 87 companies. At the start of the second semester, six courses were added and enrollment increased to 629 men from more than 150 companies. Several companies provided some financial support and loaned both men and equipment. Firms which supported the program include Ford, General Motors, Chrysler, Fruehauf, Evans Products, and others.

Handling Firms Merge, Add to Plant

Mechanical Handling Systems, Inc., has purchased Loudon Machinery Co. of Fairfield, Iowa. Purchase price was said to be in excess of \$2 million. The Loudon company manufactures farm building hardware and equipment.

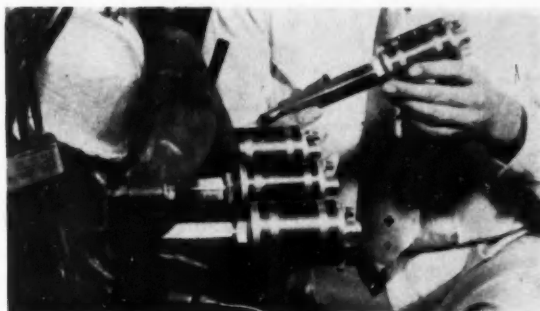
Palmer-Shile Co. of Detroit, manufacturers of materials handling equipment, announce an additional 15,000 sq ft of manufacturing capacity known as Plant #4. This is the third expansion in the last three years.

Reject Two Unions

Two unions attempting to organize the new Edmore, Mich., plant of Carboly Dept. of General Electric Co. have been rebuffed in NLRB elections held late in August. In the secret balloting, employees rejected representation by both UAW-CIO for production workers and the IEW-AFL for maintenance employees. Among production workers 161 out of 165 eligible voted. Thirty-three of 34 eligible maintenance workers cast ballots and in both instances the no-union vote was decisive.

FASTER ANALYZER

Tiny valves beside special small spark plugs trap exhaust gases in this new Ford test method. Carbon dioxide content is checked in 30 minutes instead of 2 1/2 hr. Valves open .02 in. for .001 sec.



Name Changes

The name of the Topper Equipment Co., manufacturers of vapor degreasers and other metal cleaners and solvents, has been changed to the Circo Equipment Co. at 120 Central Ave., Clark Township (Rahway), N. J. In the past year, the company has pioneered in the production of equipment for ultrasonic cleaning.

Artificial Mineral

Norton Co., Worcester, Mass., has developed in the laboratory a new form of mineral, not found in nature, a crystallized silica. Its hardness is comparable to that of garnet or topaz, with a Knoop hardness value of about 1300 measured with a 100 gram load. Although this new material resembles mica, one of the common constituents

of quartz containing rocks it is considerably harder and does not react to chemical tests as does mica.

Rural Postmen Travel

Over 1.5 million miles daily is the distance travelled by members of the National Rural Letter Carriers' Association. Many of the more than 30,000 carriers assembled at Chicago recently for the 50th anniversary convention. Among the firms participating was Dualoc Drive, Inc., makers of a locking differential.

New Laboratories

Electric Storage Battery Co. has opened its newly expanded laboratories in a new building in Philadelphia.

(Turn to page 98, please)

1953 RETAIL CAR SALES BY PRICE GROUPS* NUMBER OF CARS

| Price Group | July | | | | Seven Months | | | |
|--------------------|---------|------------|---------|------------|--------------|------------|-----------|------------|
| | 1953 | | 1952 | | 1953 | | 1952 | |
| | Units† | % of Total | Units† | % of Total | Units† | % of Total | Units† | % of Total |
| Under \$2,000 | 294,834 | 55.51 | 164,838 | 48.84 | 1,831,296 | 53.96 | 1,292,242 | 52.46 |
| \$2,001 to \$2,500 | 181,920 | 28.60 | 101,883 | 30.19 | 965,207 | 28.44 | 781,475 | 30.90 |
| \$2,501 to \$3,500 | 83,190 | 11.90 | 53,408 | 15.63 | 454,965 | 13.40 | 317,013 | 12.87 |
| Over \$3,500 | 21,193 | 3.99 | 17,330 | 5.14 | 142,621 | 4.20 | 102,632 | 4.17 |
| Total | 531,127 | 100.00 | 337,466 | 100.00 | 3,384,049 | 100.00 | 2,483,562 | 100.00 |

DOLLAR VOLUME OF SALES*

| Price Group | July | | | | Seven Months | | | |
|--------------------|-----------------|------------|---------------|------------|-----------------|------------|-----------------|------------|
| | 1953 | | 1952 | | 1953 | | 1952 | |
| | Dollars | % of Total | Dollars | % of Total | Dollars | % of Total | Dollars | % of Total |
| Under \$2,000 | \$ 524,910,127 | 47.06 | \$292,849,889 | 40.44 | \$3,274,885,154 | 45.40 | \$2,282,182,632 | 44.05 |
| \$2,001 to \$2,500 | 338,464,185 | 30.35 | 225,401,467 | 31.12 | 2,154,005,154 | 29.60 | 1,685,616,464 | 32.14 |
| \$2,501 to \$3,500 | 173,219,825 | 15.53 | 142,740,190 | 19.71 | 1,248,296,074 | 17.31 | 867,134,626 | 16.54 |
| Over \$3,500 | 78,716,238 | 7.06 | 63,255,632 | 8.73 | 536,146,316 | 7.43 | 378,656,969 | 7.27 |
| Total | \$1,115,310,375 | 100.00 | \$724,247,378 | 100.00 | \$7,213,332,700 | 100.00 | \$5,181,762,291 | 100.00 |

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.
†—New registrations of American made cars only. Does not include imported foreign cars.

Men in the News



Harnischfeger Corp.—Frank C. Edwards has been promoted to general manager of the P&H Diesel Engine Div.



Willys Motors, Inc.—Joseph H. Pargeter now heads the steel forge operation.



Houdaille - Hershey Corp.—Thomas H. Sheehan has been raised to manager of manufacturing, succeeding C. B. Eisenhauer who is staff assistant to the general manager.

Electric Auto-Lite Co.—Robert C. Held, manager of the sales order department, and F. J. Wilson, assistant purchasing agent, have retired. L. J. McGrady has been appointed assistant advertising manager.

Fisher Body Div.—F. G. Nentwig was named director of safety and fire prevention.

Ford Motor Co.—Dr. Michael Ference, Jr., has been appointed chief scientist of the engineering staff scientific laboratory.

Dow Chemical Co.—Luther Evans now is director of labor relations.

North American Aviation, Inc.—Dr. John P. Howe is chief of the atomic research department reactor materials section.

Convair—A. W. Morgan has been named general manufacturing manager of the San Diego Div., and W. L. Young is works manager. W. C. Rockefeller has resigned as a director and executive assistant to the chairman of the board.

Timken-Detroit Axle Co.—Appointment of Sherman T. Ramey as advertising manager has been announced.

Dodge Div.—Fred C. Martin has been named comptroller.

Bohn Aluminum and Brass Corp.—David Walters has been appointed chief industrial engineer. Guy Pitts has been advanced to manager of the Brass and Bronze Div., and Frank Turnbull is now scrap buyer for Mich. Smelting and Refining Div.

Muskegon Piston Ring Co.—Harold G. Vaughan was advanced to president, succeeding T. E. McFall who continues as chairman.



Eaton Mfg. Co., Foundry Div.—S. David Taylor was promoted to assistant general manager, Paul W. Olson to resident manager, and Howard R. Johnson to factory manager.

Buick Motor Div.—Floyd J. Compson recently became director of purchases, following the retirement of Russell H. Eddy. Conn L. Clifford and James J. Sherry, Jr., are assistant directors.

Babcock & Wilcox Co.—William J. Thomas is now general manager of the Tubular Products Div. Paul J. Utnehmer, works manager, has been named to the division board of directors.

Mullins Mfg. Corp.—Harold O. Smith is now general manager of operations for plants at Salem and Warren, O.

Elastic Stop Nut Corp.—James B. Duke has joined the firm as technical assistant to the general sales manager.

Willys Motors, Inc.—John W. Raisbeck became assistant general sales manager of the new Kaiser-Willys Sales Div. Don H. Smith is sales promotion manager.

Cleveland Graphite Bronze Co.—Dorward C. Witzke has joined the firm as assistant to the president.



Detroit Broach Co.—E. H. H. Graf has been elected vice-president in charge of sales.

Casco Products Corp.—W. R. Powell recently was appointed assistant vice-president, Automotive Div.

Caterpillar Tractor Co.—Two new supervising engineers are Donald E. De Canniere, for bulldozers and cable controls, and John A. Junck, for hydraulic controls and tool bars.

Thompson Products, Inc.—Promotion of William G. Angst to Detroit plant manager has been revealed.

Koppers Co., Inc.—John W. Pennington was raised to manager of the technical department of the Metal Products Div.

Lincoln-Mercury Div.—In a realignment of the sales department, A. H. Crowley, Henry B. Danials and R. R. Nadal were named assistant general sales managers in charge of Mercury sales, Lincoln sales, and staff activities respectively. C. L. Hostetler fills the new post of manager of fleet sales. R. G. F. Copeland, advertising manager, is also manager of sales promotion and training.

National Motor Bearing Co.—Ralph Zimmerman has been promoted to chief product engineer.



Chrysler Div.—E. M. Braden was made general sales manager recently.



Mack Mfg. Corp.—Elliot G. Ewell was elected to the board, and also vice-president of Mack Trucks, Inc.



Ainsworth Mfg. Corp.—Robert E. Dickson has joined the company as director of purchasing.



F. L. Jacobs Co.—Nicholas Kondur is now manager of the Detroit Div.



Niles - Bement-Pond Co.—Louis Reiss is now treasurer, succeeding R. W. Banfield who continues as vice-president.



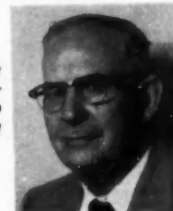
Glenn L. Martin Co.—Erle M. Constable was named assistant vice-president for procurement.

Rochester Products Div., General Motors—Raymond A. Thon succeeds retiring E. P. Mynott as director of quality control.



Hyster Co.—John Reich was advanced to factory manager of the Danville, Ill. plant.

Electric Auto - Lite Co.—George L. McCaffrey was raised to general purchasing agent.



Standard Products Co.—Promotion of R. E. McIntyre to executive vice-president has been announced. He is also treasurer and a board member.

Permold Co.—Everett G. Fahlman, president, has been named deputy director of the aluminum division of National Production Authority, Dept. of Commerce. John E. Fahlman, director of procurement and assistant secretary, was appointed acting general manager of the firm.

Union Drawn Div., Republic Steel Corp.—Eugene B. Files recently became manager of sales, succeeding the late Fred C. Young.

Century Controls Corp.—Ernest G. LeMay, Jr., has been appointed president and general manager of the new firm.

Thomas A. Edison, Inc.—George J. Binewald is the new sales manager of the Edison Instrument Div.

Unitcast Corp.—Richard H. Turner was elected vice-president in charge of purchasing.

R. M. Hollingshead Corp.—Leon M. Wheatley was promoted to vice-president.

Collins & Aikman Corp.—W. F. Bird was elected president, succeeding Albert R. Jube, who became chairman.

R. K. LeBlond Machine Tool Co.—A. H. Davis is now works manager.

Landis Tool Co.—A. J. Jones was appointed chief engineer.

Chain Belt Co.—George D. Gilbert is retiring as secretary and a director. W. C. Messinger was elected secretary, Edward M. Rhodes is manager of the Baldwin-Duckworth Div., and R. V. Poisson is division sales manager.

Townsend Co.—Fred J. Schreiber, Jr., was named director of commercial research.

Reynolds Metals Co.—W. Monroe Wells is now assistant vice-president in charge of operations.

United Metal Craft Co., Gar Wood—Clair S. Reed has been elected vice-president, director and a member of the executive committee.

Inter-Industry Highway Safety Committee—W. F. Hufstader, a General Motors vice-president, was re-elected chairman.

Necrology

Littleton C. Barkley, 51, general sales manager of the West Coast Div. of Raybestos-Manhattan, Inc., died Aug. 27 at San Mateo, Calif.

Charles H. Martin, 85, pioneer auto builder and inventor of the tractor-trailer fifth wheel, died at Springfield, Mass., on Sept. 4.

Charles S. MacDonald, 64, president of the Cummins Diesel Railroad Equipment Co., died in New York City.

J. Irving Schultz, 47, vice-president and treasurer of the National Broach & Machine Co., died Sept. 12 at Pleasant Ridge, Mich.

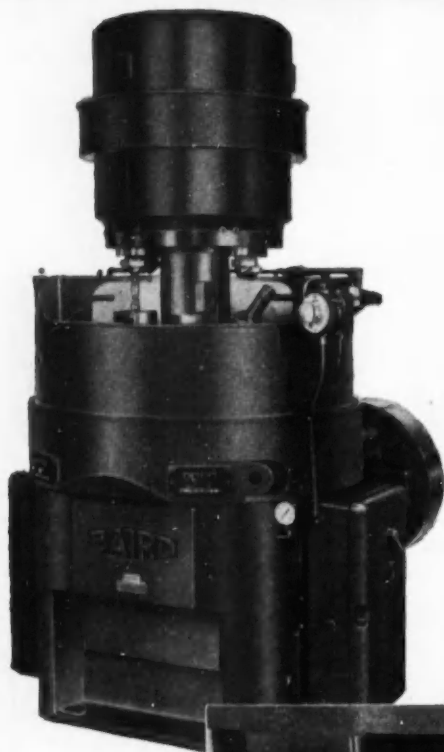
Bayard D. Kunkle, 70, member of the board and retired vice-president of General Motors Corp., died Sept. 14 in Detroit, Mich.

ASK

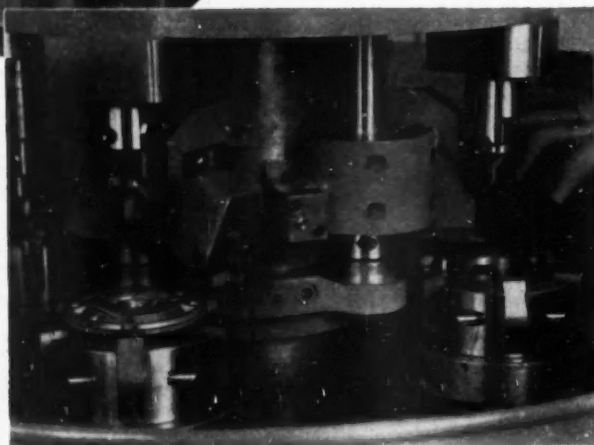
BAIRD

ABOUT IT!

HIGH PRODUCTION TOOLING



(Above) Front view, showing splash guards for wet cutting.



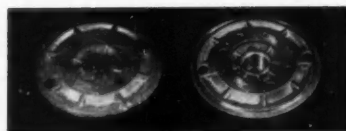
(Right) Tooling set-up for finishing a generator end plate.

TOOLS MOVE HORIZONTALLY, OTHERS VERTICALLY, FOR FACING . . . TURNING

. . . and that's but one of the excellent features of Baird's No. 54VC (5" chuck, 4-spindle, vertical continuous lathe). As the turret revolves, eliminating unproductive indexing time, holding fixtures grip and release automatically for easy loading and unloading. Tools feed in and out of the cutting stroke.

This typical Baird tooling set-up bores the hole, faces and chamfers the hub, and turns the flange of a generator end plate. Cycle time 19.48 seconds, 5 seconds per piece, 720 per hour. Feed: boring hole and facing hub .0039" . . . turning flange .005" and .002" (forming tools). Cutting speeds: boring 348 ft.; turning 1985 ft. per minute.

Safety for operator and prevention of machine and product damage are mechanically and electrically controlled; tools cannot feed to work unless spindles are revolving; electrical equipment is enclosed, wiring concealed.



BEFORE AND AFTER

FEATURES BAIRD 4-SPINDLE VERTICAL LATHE

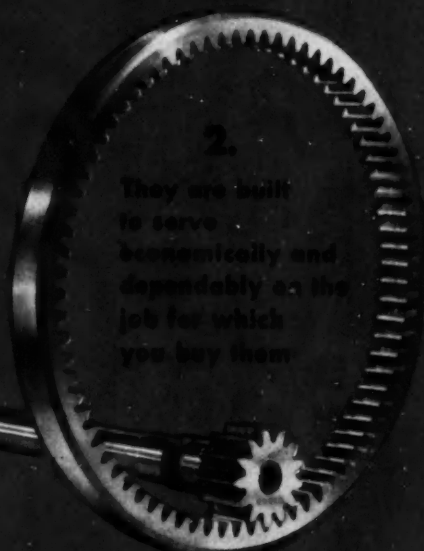
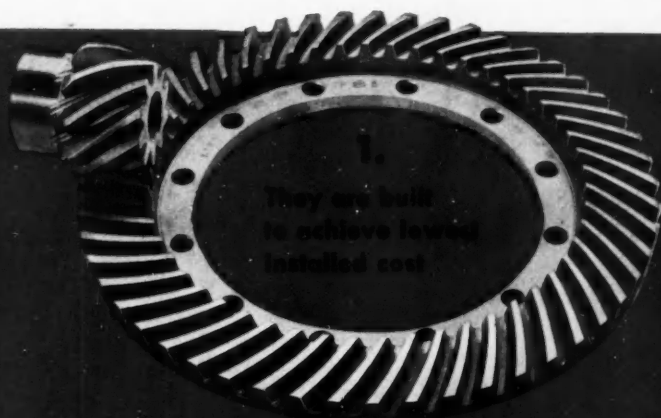
1. Compact design.
2. Easy to tool and operate.
3. Simple . . . dependable.
4. Extremely accurate.
5. Unusually versatile.
6. Outstanding production records.

Installation of Baird automatic machines is a step in the right direction against tough competition. "Ask Baird about it!"

the **BAIRD MACHINE COMPANY**
STRATFORD • CONNECTICUT

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING
MACHINES • AUTOMATIC PRESS • TURNING BARRELS

When you look into Double Diamonds
THREE FACTS stand out...



May we send you a copy of this comprehensive catalog on the ten gear types in which we specialize?



AUTOMOTIVE GEAR WORKS, INC.

RICHMOND,

INDIANA

FOR FARM EQUIPMENT, AUTOMOTIVE &

GENERAL INDUSTRIAL APPLICATIONS

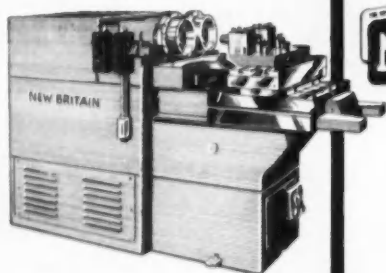


New Britain Builds the . . .

CAM OPERATED Boring Machine



Cam actuation reproduces tolerances and finishes with absolute certainty piece after piece, hour after hour, day after day.



THE NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut

. . . Machines for Making Progress

Automatic Bar and Chucking Machines

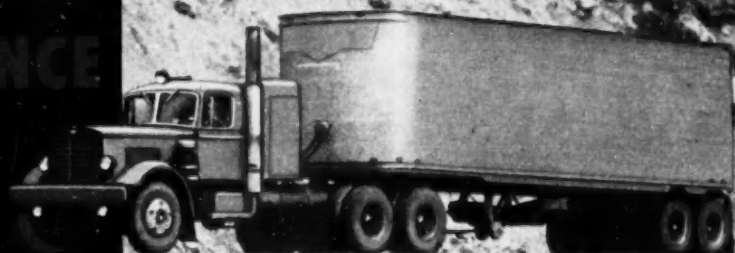
Precision Boring Machines

Lucas Horizontal Boring, Drilling and Milling Machines

New Britain •GF• Copying Lathes

NEW BRITAIN
Automatics

...the
EXTRA
BRAKING
PERFORMANCE
proven
here ...



... means
SAFER,
Surer STOPS
on any
hauling job!

**Smooth, Sure-Acting Bendix-Westinghouse Air Brakes
Step-up Schedules, Safety and Profits on Rugged Runs!**

How would you like to help your truck customers shorten trip schedule time? Step up driver efficiency? Increase their margin of profits? Obviously, you would . . . and you can by simply taking a tip from the men who operate the big rigs over the rugged Rocky Mountains. Here, **under the toughest, most demanding conditions, fleet records show Bendix-Westinghouse Air Brakes help answer** all three questions. That's because these mighty brakes deliver the extra stopping power and performance that assure maximum control—anywhere, any time. As a result, **unnecessary slowdowns are eliminated because drivers know they can stop.** Thus, trip speeds can be increased, heavier payloads carried safely. In addition, Bendix-Westinghouse Air Brakes require less maintenance—overhead comes down because **trucks stay on the job instead of piling up expense in the shop.** So just add up all the advantages. No matter what type trucks you manufacture, give your customers the benefits of added performance and profits by specifying Bendix-Westinghouse, the world's most tried and trusted air brakes!

Bendix-Westinghouse



THE WORLD'S MOST TRIED AND TRUSTED

AIR BRAKES

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY • ELYRIA, OHIO • BERKELEY, CALIF.



Flying "taxis" that open up new roads

Miraculous rescue flights over Korean combat zones put helicopters in the spotlight. Soon, 'copters like these three leaders will open up more and more new "roads" in America's skies.

Powered by always dependable, air-cooled engines built by Lycoming, these helicopters are already used by industry as flying "taxis" to transport executives from plant to plant. Soon, major cities will get aerocab service from midtown terminals to airport flight lines. Later, every state in the union will get super "taxi" service between cities . . . and even commuter service from suburbs to hearts of business sections.

Dependable Lycoming power has helped these leading helicopters achieve outstanding safety records. This is another Lycoming contribution to America's progress in the air; another reason why we say: "For efficient, dependable, air-cooled power . . . look to Lycoming!"

Air-Cooled Engines for Aircraft and Industrial Uses
Precision and Volume Machine Parts
Gray-Iron Castings • Steel-Plate Fabrication

FOR RESEARCH • FOR PRECISION PRODUCTION

LOOK TO **LYCOMING**

Lycoming Spencer Division
Williamsport, Pa.



Bridgeport-Lycoming Division
Stafford, Conn.

*Wright Cyclone engine, built by Lycoming under license from Curtiss-Wright Corporation, Wright Aeronautical Division.

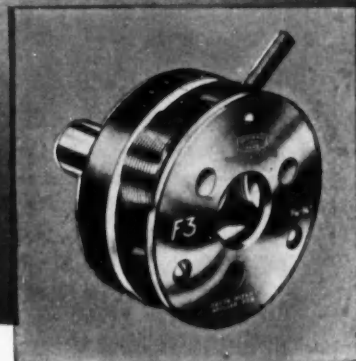


DOMAN LZ-5. Powered by a Lycoming 400-h.p. engine. Speed, 110 m.p.h. Range, 220 miles.

KAMAN K-240. Powered by a 250-h.p. Lycoming engine. Speed, 90 m.p.h. Range, 210 miles.

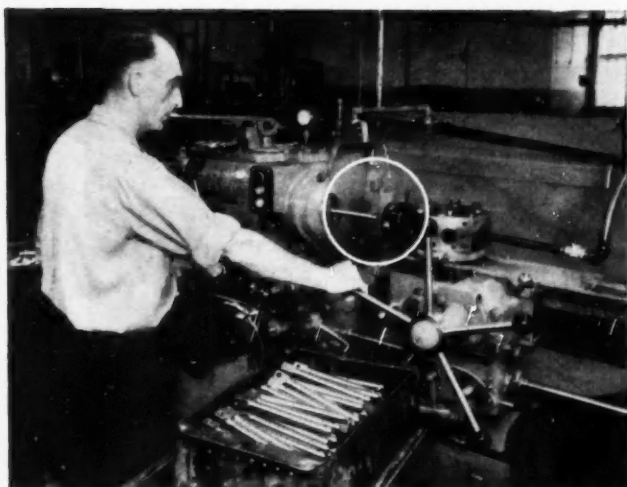
PIASECKI H-21. Powered by a 1425-h.p. Lycoming engine. Speed, over 115 m.p.h. Range, over 200 miles.

SAMPLE
 Rolled thread on Clamp Screw
 $\frac{3}{4}$ " - 10 pitch $\frac{6}{16}$ " long
 Class 3-1045 steel
 Time - 9.5 seconds at 90 S. F.
 Finish - 20 Micro inch
 Note: Rolling increased
 Rockwell B hardness 5 points



WHY THIS NEW SELF-OPENING HEAD

Rolls threads more accurately • stronger •
 smoother...and cheaper than any other tool



$\frac{3}{4}$ " Self-Opening head rolling piece shown on a hand operated turret lathe.

This "Fette" patent chipless thread forming method is different—material rolled flows in an axial direction so that the thread is generated ahead of the rolls. Flow to full depth of thread avoids broken grain structure and cratering crest; surfaces are densified, smoother, more wear resistant. Part shown is unretouched.

It works like this—annular grooved rolls are positioned in plates in the head and only the rolls are changed for different thread forms or pitches. Fine adjustment is provided for exacting diameters. Rolling speeds are equivalent to turning speeds.

Self-opening heads, with simple quick-acting gear mechanism, frees the work instantly at proper thread length; no lead screw or follow up cam required.

These National Acme (Fette patent) Heads accommodate all standard parallel thread forms and are made in both revolving and non-revolving types suited to horizontal and vertical machines.

Bulletin FRH-53 gives full data

Manufactured and Sold in U. S. A. only by

The NATIONAL ACME COMPANY

170 East 131st Street • Cleveland 8, Ohio, U.S.A.

Automatic Stamping and Welding of Sheet Metal Parts

SINCE its official opening some few years ago the Nine-Mile Press Plant, Chrysler Corp., has undergone extensive expansion of productive floor space as well as new equipment, additions, and is tooling a large addition which was recently completed. Total floor space in this plant now is one million sq ft.

With the passage of time the management of this plant has introduced many advanced procedures and methods, and has plans for increasing the application of automation on press lines and on welding lines. The problem of scrap disposal also has been given close attention in the new program.

This article presents a pictorial perspective of some of the advanced methods now in operation. The first of these is an example of press line automation. The illustration selected for this purpose touches on one section of the line-up of four big Hamilton presses for making floor pan sections. In this instance, the center section is processed through the four presses.

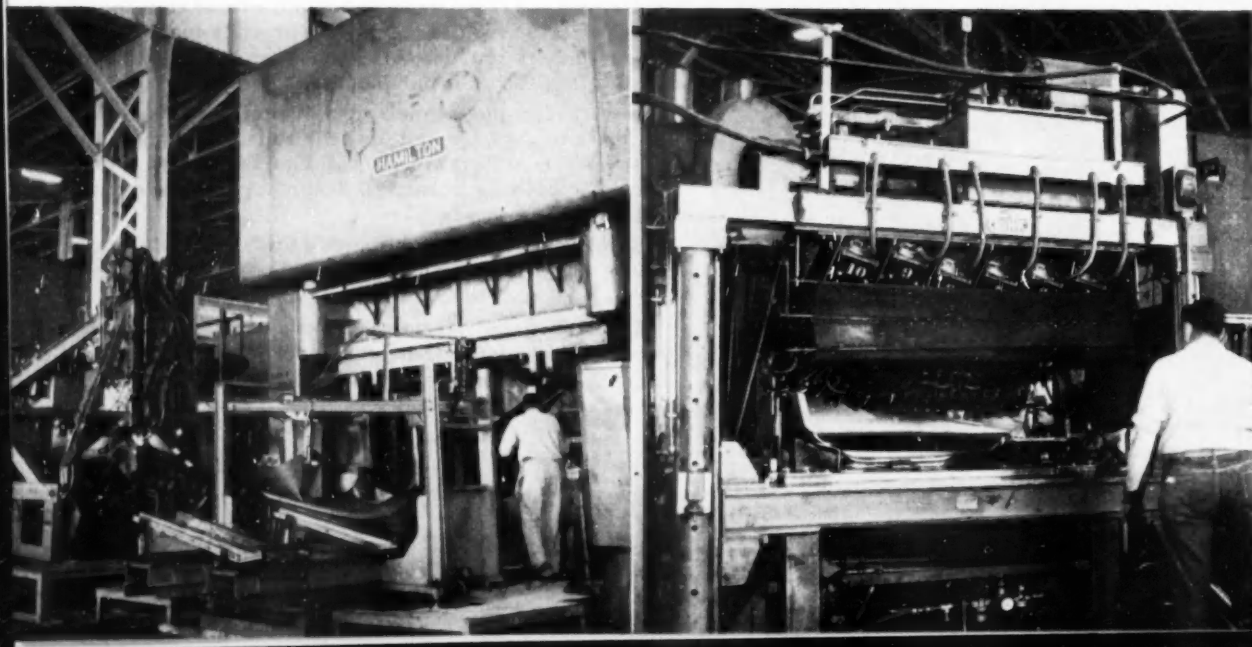
Perspective of special Chrysler-built welding machine and stamping carrier teamed up to feed nosed front fender to the first operation Hamilton press seen here. The welder, which automatically forms and seam welds the fender nose, is at the extreme left. The carrier, in the foreground, picks up each blank by means of the automatic hand and stacks it in readiness for feeding to the press.

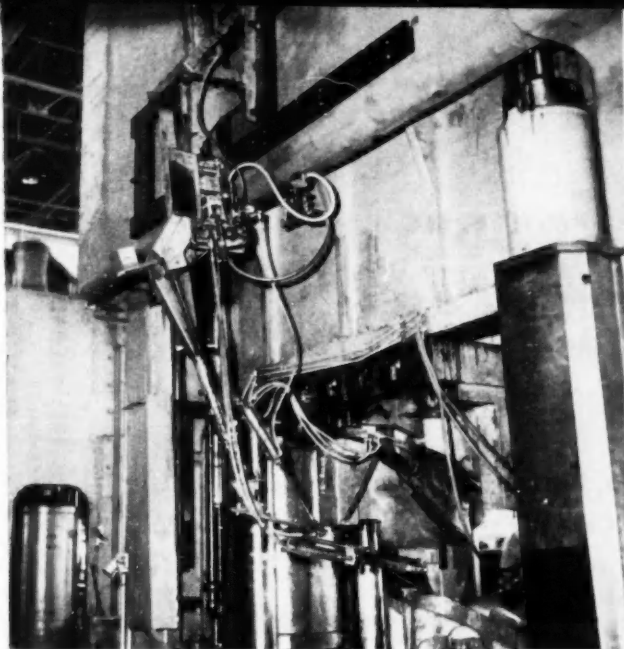
This particular example shows the use of the Sahlin iron hand for unloading the stamping at the rear of each press. Between the presses the stamping is deposited by the iron hand onto an independently driven belt conveyor for transfer to the next press.

Current model Plymouth front fenders are produced in two sections—the upper and lower stampings—the upper section being later welded into an integral fender in a single operation. The upper section, made from a uniquely formed blank, has the forward end nosed and seam welded in the special welding machine shown here. Designed by Chrysler engineers, this machine forms the nose section first, then seam-welds the resulting joint. As illustrated, the finished blank is ejected automatically, then picked up by the small iron hand and stacked for feeding the Hamilton press which does the main drawing operation. Nosing, redrawing, and trimming are done on a battery of smaller Clearing presses lined up directly behind the Hamilton press.

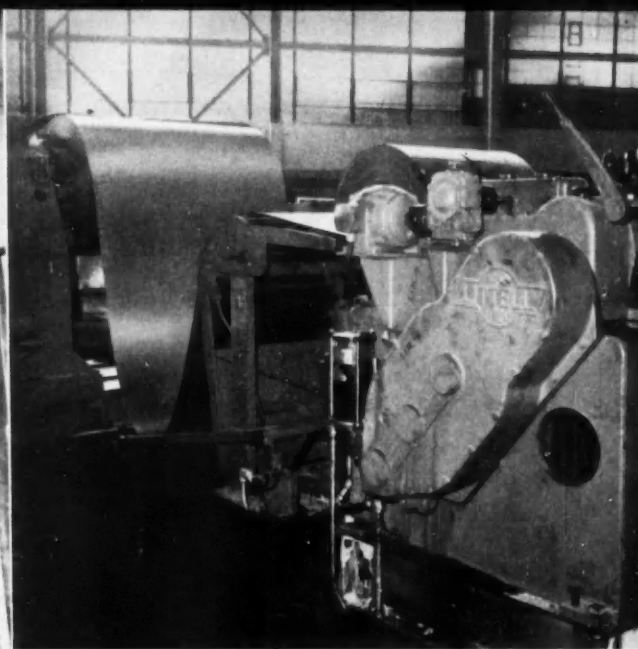
One of the newest lines to be placed in operation recently is a door panel stamping line, arranged on a group of Clearing presses. As on other lines in this

Large multi-spot Link welding machine is set up for spot welding upper and lower fender sections into a single unit.





Typical of many similar installations on presses in this plant is this closeup of a sahlun iron hand poised to pick a finished blank out of the die.



Here is a close-up of one of the giant Littell feeding attachments recently installed in the plant. It is capable of handling coils of largest diameters, weighing up to 20 tons.

plant, the stamping is removed automatically by means of the Sahlin hand. However, in this case the stamping must be turned over for the second operation and this maneuver is handled automatically by means of the turn-over mechanism at the head of the belt conveyor.

Much of the automatic spot welding is handled in specially designed multi-spot Link welding machines. An outstanding example, by virtue of featuring automation, is the welding of door pillar assemblies. As illustrated, the pillar assembly is placed on transfer bars, clamped automatically, welded at the first station, then moved to a second station for completing the welds. The third station, insofar as the transfer mechanism is concerned, is the automatic unloading onto a belt conveyor which transports the parts to succeeding operations.

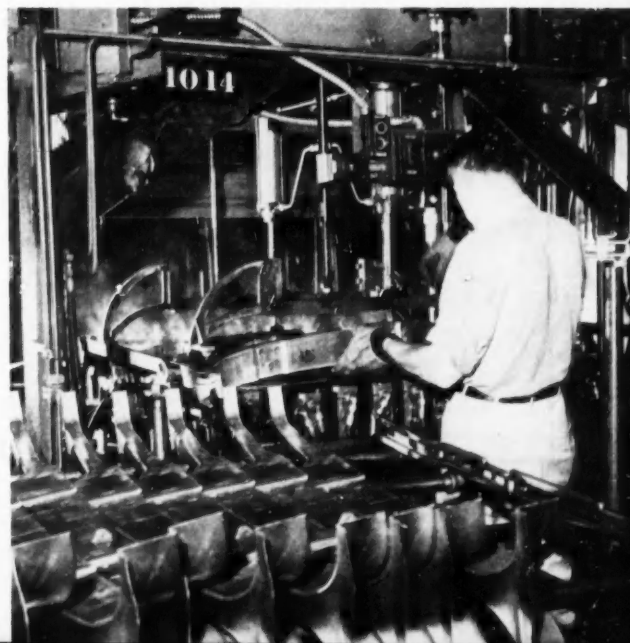
Mention was made earlier of the Plymouth front fender. After the upper and lower sections have been completed, both stampings meet at the large Link welder shown here, where they are welded together in a single, rapid cycle of the machine. It is of interest that the machine has 24 welding guns, arranged in two rows with each row firing simultaneously.

In an operation as extensive as this one, management must anticipate advances in practice and changes in techniques for long periods ahead. Noteworthy example of this is found in the installation of the latest type of Littell feeding equipment. Up to now the largest coils of steel sheet have ranged up to 10 tons in weight. However, it appears likely that before long the steel mills will find it expedient to make coils up to 20 tons in weight, thus taxing the capacity of equipment in general use throughout the industry. The feed roll illustrated is of a new design, featuring a heavy arbor and with sufficient swing to handle coils of largest diameter.

Incidentally, the press being served by this Littell feed is very versatile, arranged to handle a wide variety of blanking operations on a gamut of parts. At the time the photograph was taken, the press was producing upper fender sections for the fender mentioned earlier.

To further anticipate changes in practice in the future, the plant has been equipped with craneways of 20- and 50-ton capacity so as to adequately handle large coils of raw material as well as larger dies and press equipment.

Door pillar assemblies are welded into an integral unit on specially designed three station Link spot welders. The panels move through two welding stations by automation and then are dropped automatically onto a conveyor for transport to the next operation.



Starting Jet Engines with Turbo-Compressor

By O. H. Jacobson, Research Engineer
and P. Volkmar, Assistant Chief of Power Plant Section,

Northrop Aircraft, Inc.,
Hawthorne, Calif.

IN many instances an application problem can be as complex and interesting as the component development. A group of Northrop engineers found this out recently while working on an Air Force project involving one of the new high thrust jet engines.

High thrust turbojet engines require high starting horsepower. One of the most practical units for delivering high horsepower with low unit weight is the pneumatic starter. Since 1947, development on pneu-

matic starters has been progressing under Navy and Air Force sponsorship. A typical starter will be described below. However, the matching development of air compressors did not keep pace with the pneumatic starter. After an extensive survey by the Northrop engineers three means of compressing sufficient air were found. One was bleeding the compressor of a J33 turbojet engine. However, this unit would have been unwieldy and expensive to operate. A second method was the parallel mating of three small Navy turbo-compressors. This would have supplied weight flow but at an insufficient pressure. The third method was by the utilization of a small French turbo-compressor, called the Palouste, which matched the starter demands very well and was just being imported by Continental Aviation and Engineering Corp. After a brief description of the starter, a description of the Palouste will be given, followed by a synopsis of the application problems.

The Air Starter

The Model ATS 140 air turbine starter of AiResearch Manufacturing Co. is typical of the starters that evolved as mentioned above. The starter is normally mounted on one of the accessory drive pads (see Fig. 1). Air is ducted to the starter from the turbo-compressor, or other source, through a suitable control valve and is discharged into the plane's engine air intake. Internally, the air enters the starter, flows through a single-stage 90 deg inward-flow-radial turbine, and exhausts forward along the axis of the shaft. The turbine output is geared down and connected through a pawl-and-ratchet engaging mechanism to a conventional AN splined shaft. Control of this gear train is by an overspeed switch that shuts off the air control valve at a safe engine speed above its self-sustaining rpm value. The specification for the ATS 140 air starter states that the turbine inlet design pressure be 45 psia at 550 F. Under these conditions, the maxi-

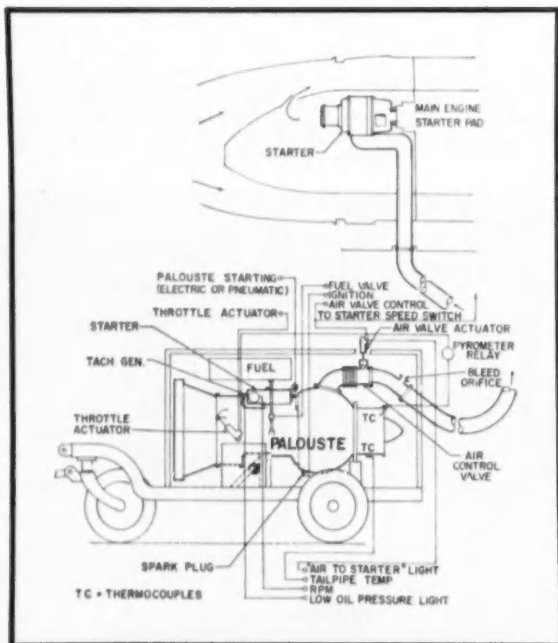
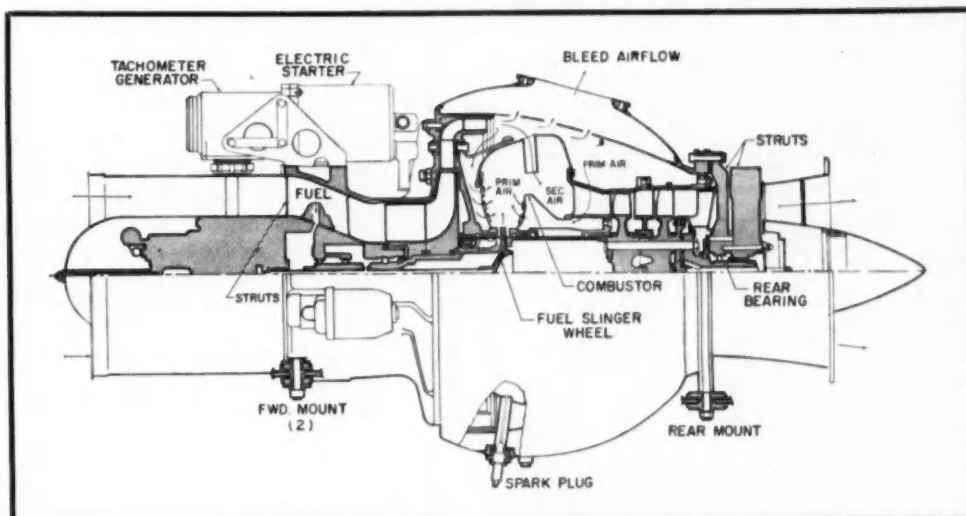


Fig. 1—Palouste turbo-compressor and main engine starter.

Fig. 2 — Part-sectional view of the Palouste turbo-compressor showing principal features.



mum airflow demand is 1.85 lb per sec (111 lb per min). Maximum airflow occurs with starter at zero output speed. A pressure regulator valve, capable of operation with inlet pressures from 45 to 76 psia, maintains the design turbine inlet pressure (for a given temperature).

The Palouste

The Palouste is one of an interesting group of engines developed by Turbomeca of Bordes, France. The Palouste turbo-compressor was developed to supply relatively large quantities of compressed air to the blade tip combustion chambers of small helicopters. It is a conventional gas turbine but produces neither jet thrust nor shaft horsepower. The compressor's major output is bleed airflow. Only enough air remains to support combustion to drive the turbine; thus, it is strictly an air compressor. However, since it operates on the gas turbine principle, we shall call it a turbo-compressor to distinguish it from other forms of air compressors. The principal features of the Palouste are shown in Fig. 2 and are described below.

The compressor inlet has an annular, axial-flow pattern. Located in this inlet duct perpendicular to the air flow are five streamlined struts that support the front bearing and provide passage for the fuel, oil, and vent air. The single-stage, one-sided centrifugal compressor has pre-whirl (or inducer) vanes attached to its inlet which form an integral part of the impeller.

Although the combustion chamber is a conventional annular type, the airflow and fuel flow passages are quite unusual. The fuel is supplied to the engine at five to eight psi. It flows in through one of the five inlet struts, then through the hollow compressor shaft, and is finally injected into the combustor through orifices in a fuel slinger wheel. Part of the primary combustion air enters the combustion zone through ports on the inner-forward face of the outer combustion housing after having reversed its flow from the axial diffuser. Secondary cooling air is introduced through radial tubes into the combustion gases at the outer aft face of the combustion zone. This secondary air follows a direct

path from the diffuser to the turbine inlet. Additional primary combustion air is drawn from the diffuser to the hollow, first-stage turbine nozzle vanes. After cooling the vanes by flowing toward the center of the engine, this air passes forward between the combustion chamber and the main shaft. It then passes into the combustion chamber.

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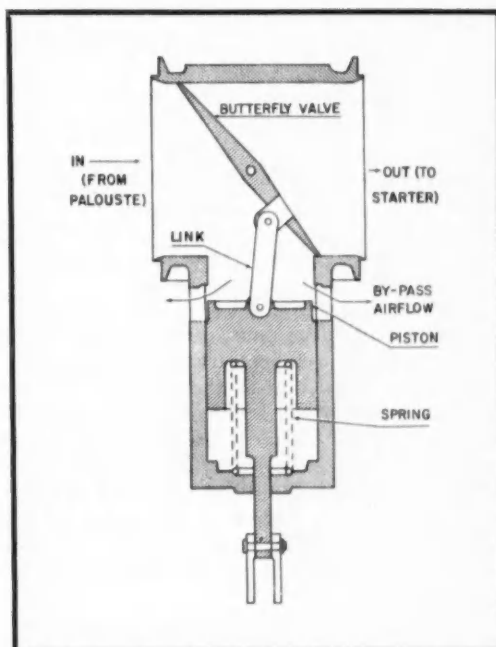


Fig. 3—Dual-element air control valve. It has a main shut-off valve linked to a by-pass valve and operated by the same actuator.

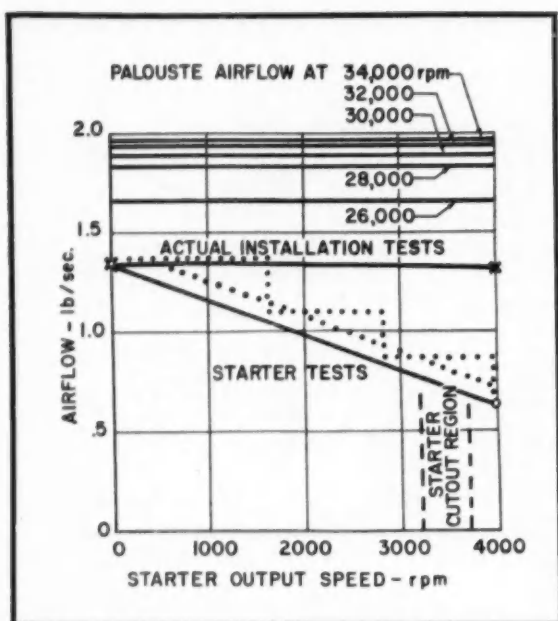


Fig. 4—Starter airflow data.

As it leaves the combustion chamber, the air-gas mixture enters a 20-vane stationary nozzle ring, then flows through two turbine stages. The total power output of this two-stage turbine is used to drive the compressor and accessories. With two stages, very little energy remains in the turbine exhaust. Two of the diffuser support struts are hollow and they carry cooling air to the rear bearing. This airflow is induced by vanes on the base of the aft face of the second-stage turbine wheel.

The bleed air leaves the compressor diffuser, travels straight aft and then radially outward through a perforated cylinder surrounding the combustion chamber and turbine. Surrounding this is a spherical case with the compressed air discharge port on the upper side.

The Palouste centrifugal compressor has a sea level rating of 6.8 lb of air per sec at a pressure ratio of 3.8:1 at 34,000 rpm. Combustion requires 4.4 lb per sec of this air, thus, the rated bleed airflow is 2.4 lb per sec at NACA standard sea level.

As usual, two limits exist for this engine. One is the compressor surge limit, resulting from a build-up of compressor outlet pressure (at a given rpm) due to excessive restriction of the airbleed. A minimum port area in the airbleed control valve prevents exceeding this limit. The other is the turbine inlet temperature limit. An excessive airbleed reduces the air available for combustion. Since a gas turbine normally operates on an extremely lean mixture, increases in fuel-air ratio, due to the decrease in secondary air with a constant fuel rate, will increase the combustion temperature.

Application Development

The principal item developed by Northrop was the air control valve which had the following requirements:

proper control of the Palouste bleed airflow to avoid compressor surge or turbine overtemperature; control of the starter by both the starting controls and the starter microswitches; and matching the starter airflow demands with the Palouste bleed airflow.

Several aborted attempts to design a control valve that would meet the above stated requirements plus those of the air starter control valve resulted in the elimination of the control valve furnished with the starter. Its functions were taken over by a dual-element valve having a main shut-off valve linked to a by-pass valve and operated by one actuator, as shown in Fig. 3.

The by-pass valve, in the open position, provides the correct bleed for the Palouste to start and accelerate. A modulation of the by-pass valve area with rpm, to minimize the bleed at start, would give faster acceleration of the Palouste, but this characteristic was not deemed worth the extra control complication. During starting and at operating speed the main shut-off valve remains closed, thereby allowing no airflow to the starter. At the operating speed, the by-pass valve provides adequate bleed airflow to prevent compressor surge or restricts the flow to prevent excessive turbine temperatures. To operate the air starter, the main shut-off valve opens and the by-pass valve closes. Here it is critical that the combined partial flows of each valve do not exceed the allowable bleed airflow and cause excessive turbine temperatures. The shape of the head of the by-pass valve controls this value. When the starter has accelerated the main engine to a self-sustaining rpm, the overspeed control switch signals the actuators to close the main shut-off valve and open the by-pass valve.

The original specification of the starter used on this project required a constant air flow, independent of speed. This could be matched either by the rpm setting of the Palouste, with a pressure loss, or by a fixed line bleed, rather than by further control of the air valve. However, further starter airflow data (see Fig. 4) shows a substantial decrease in starter airflow demand with increased starter rpm. It appeared that this new requirement could be met by opening the by-pass valve, either continuously or in steps as the starter rpm increased, as shown by the dotted lines in Fig. 4. Since this control could be manual as well as automatic, the test phase was begun without delay, using manual control. When the starter was installed on an engine, the airflow demand was very close to the original design requirement. Perhaps the low pressure region into which the starter exhausts, as compared with a constant ambient pressure on a starter test stand, affected the airflow requirement. On this installation, the starter exhausts into the engine compressor inlet. As engine speed increases, the pressure at this point falls due to the friction losses in the forward part of the duct.

Preliminary tests were made on the air control valve to insure safe operation of the Palouste. A

(Turn to page 104, please)

Timely Tractor Problems Analyzed at SAE Meeting

FOR the third consecutive year the Production Forum played to a large gathering in Milwaukee at the SAE National Tractor Meeting in September. In fact something over 360 specialists crowded the meeting rooms to participate in the seven panel sessions.

Latest Developments in Forging

At one stage the forging panel was occupied with a discussion of competitive methods for making crankshafts—conventional foundry practice as well as the role of shell molding. One of the steel foundry men at the session mentioned that in his experience shell molding seemed best adapted to the making of small steel parts where closer tolerances and better surface finish were essential. In general, the consensus was that forged crankshafts would be with us for a long time to come.

Some of the newer developments in the forging field are of interest. One of these is cold extrusion which has been noted in the literature during the past few years. One of the specialists also drew attention to semi-hot and hot extrusion, in which there is a combination of hot and cold operations, seemingly holding promise of important advantages. Comment was made too on an interesting technique being practiced in Germany—hammer precision forging of gears with teeth. As a matter of fact, it was reported that such gears appear to be acceptable for use in certain heavy duty automotive applications.

Definite Standards Needed for Quality Control

Five years ago when statistical quality control was being discussed at Production Forum sessions, only a handful of people in the audience had had any experience with the technique. Currently, practically everyone who was in the audience is familiar with its details and many are using the technique. One of the newer questions is that of controlling operations subject to visual inspection contrasted with machined parts. This applies to assemblies as well as operations such as welding, brazing, paint finish, etc. The answer to control of such operations appears to lie in defining the problem completely and then training both the operator and inspector in control techniques. The consensus was that it is time for engineering to get in

the act and set up definite standards of quality directly on the drawing wherever that tends to be feasible.

Welding, Cutting and Flame Hardening

Welding is a basic operation in the tractor field and the session on welding considered such questions as the selection of materials, with emphasis on boron steels, on problems of flame cutting and flame hardening, and selection of welding electrodes. There was considerable discussion of techniques required to reduce cracking after flame hardening and flame cutting as well as means for controlling hardness. It was evident that the present state of the art requires much closer cooperation of designers and welding experts.

Cutting Tools and Fluids

The session on machine tools and tooling was concerned at one point with cutting tools, particularly in handling sand castings with hard scale and sand inclusions. It was mentioned that some interest is being generated in a line of ceramic cutting tools being exploited in England and being tested on a limited scale in the U. S. These tools are said to be particularly useful in cutting certain of the more abrasive engineering materials. Some experimental work is being done with an improvement in the application of cutting fluids. One of the participants mentioned recent work indicating that best results are obtained by applying a small high pressure jet of cutting fluid at the leading edge of the tool. This is said to be more effective than a large stream of fluid over the work.

Difficulties With Some Types of Steel

As usual it was difficult to separate the panels on gears and heat treatment since the two are so intimately related. One surprising trend of discussion was the more or less critical view of boron steels. Many metallurgists in this group felt they still did not know enough about the heat treatment of these materials and remarked that there was too much variability in hardness; while some found it necessary to check each heat to select a narrow hardenability band pattern, disposing of the rest. It seemed to be the opinion, at least among tractor men, that they would prefer to switch to other types of steel.

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Amazing Recovery

FROM HYDRA-MATIC FIRE



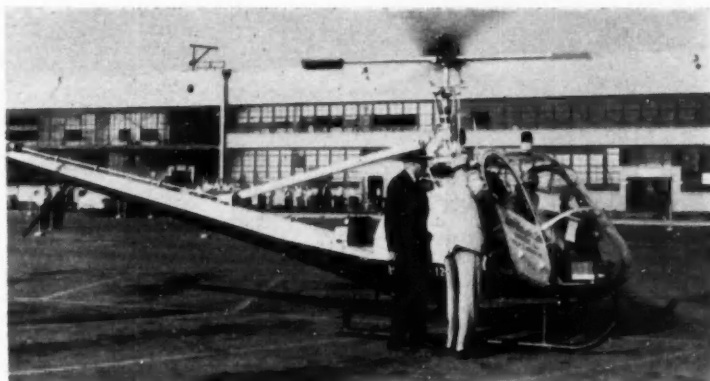
Total destruction of every part of the Livonia plant can be visualized from this view. The entire structure was flattened as seen here.

By Joseph Geschelin

**Greatest Single Catastrophe
in American Industry, Causing
Only a Temporary Setback in
Production of Vehicles**

OPERATION Hydra-Matic will go down in the record books as a pointed example of the effectiveness of bigness in business enterprise. Disaster struck the Livonia Hydra-Matic plant of General Motors at 3:50 PM on August 12 when sparks from a maintenance torch initiated a chain of unfortunate events that razed the entire 1,500,000 sq ft structure. By 10 AM the next day while fire equipment still was vainly engaged in checking the fire, top executives of the corporation—vice presidents S. E. Skinner and J. F. Gordon—together with L. C. Goad, executive vice-president, and president Harlow H. Curtice joined in an emergency meeting at the plant to plan the moves for re-establishing production of Hydra-Matic transmissions.

As was demonstrated at the start of WW II bigness in business implies vision and imagination, unlimited resources in capital and manpower, and



S. E. Skinner, GM vice-pres., arrives on scene in emergency helicopter flight from Lockport.

executives capable of making major decisions without fumbling. By next morning, the executive group had contacted selected plants of the 116 plants of the corporation and had borrowed from the various divisions a total of some 188 specialists — master mechanics, plant engineers, maintenance experts — who were dispatched to Livonia by air, by car, and by rail.

The morning following the fire most of these men were on the scene for preliminary briefing.

Considered to be the greatest single catastrophe in American industry, the Livonia fire poses important questions as to modern building construction, fire protection, and other details that may well cause a major change in the concept of industrial building design. To management in the automotive industries, the details of Operation Hydra-Matic will be of interest from the standpoint of what can be accomplished in the face of an appalling emergency.

Before considering the ramifications of the problem, let us outline the basic program initiated by the Central Office executive group. It must be remembered that the disaster affected Cadillac, Oldsmobile, Pontiac, and GMC Truck & Coach, besides stranding companies outside the GM family — Hudson, Lincoln, Kaiser, Nash.

The following outline will give the picture briefly:

1. Establishment of Hydra-Matic production on a comparable scale at Willow Run where the corporation executed a lease with Kaiser for 1,500,000 sq ft. This project was tied in with immediate salvage and rebuilding of machine tools that survived the fire; acquisition of additional machine tools to replace those beyond repair; manufacture of jigs and

fixtures destroyed by the fire; and replacement of the many items of gages and inspection equipment rendered useless.

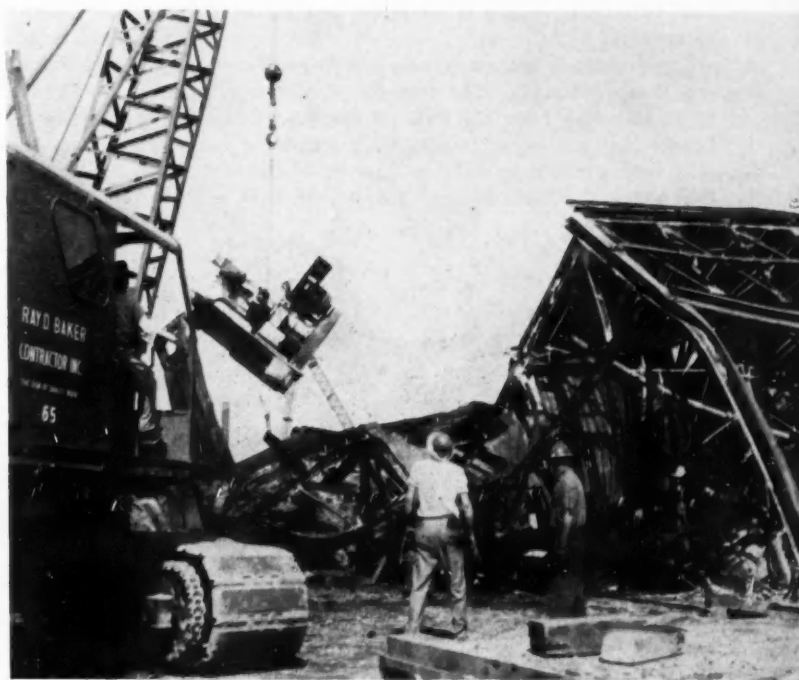
2. Initiation of a sub-contracting program for producing H-M components by many outside manufacturers, including a number of GM Divisions. Parts thus produced are to flow to the Riopelle plant, the original home of H-M where assembly and testing will be reorganized.

3. Emergency plans, announced at the time, to establish some production of automatic drive cars by diverting Dynaflo transmissions to Cadillac and Oldsmobile; Powerglide drive to Pontiac.

4. Long-range planning to rebuild Livonia.

Although the foregoing lists these moves in a given order, it will be appreciated that action is simultaneous on all facets of the emergency plan with all of the projects given immediate attention.

Out of the complex of program there emerged a definite pattern for a timetable. It was approximate at the time this article was prepared and should be



For more than 10 days scenes such as this—lifting a machine tool out of the wreckage—took place all over the property.

more definite by the time the article is in print. In any event, a major effort was made to have some flow of Dynaflo and Powerglide transmissions at the earliest moment so as to establish modest production of Cadillac, Oldsmobile, and Pontiac.

The sales problem is serious since Cadillac has employed automatic drive 100 per cent; Oldsmobile 98 per cent. And it is doubtful whether the buyers would accept anything but automatic drive in cars of this price class. At the best, however, Dynaflo and Powerglide can handle only a small percentage of requirements and even this entailed the impressing of additional facilities and additional working hours with the penalty of overtime operations.

It is obvious too that more synchromesh transmissions will have to go into Buick Specials, Pontiacs, and Chevrolets while the emergency persists.

In any event this move is expected to be a temporary expedient to initiate production of 1953 cars. The major help, necessarily, must come from the Riopelle assembly plant which will be fed from the sub-contracting pool. The original estimate—at least the goal—for this phase was some six to eight weeks from the date of the fire. If this materializes H-M drives should be available on 1953 cars within a short time after this article is published and in the hands of readers.

Backing these palliative measures is projected Willow Run production. The established goal was from 90 to 120 days from the date of the fire. Given the breaks that are being created by enterprising action, this may provide production flow by December. In that event, it should be a certainty that 1954 models



Team captains being briefed at sessions such as this one in preparation for the big salvage job. The master plan established 38 rehabilitation teams, each headed by a captain—usually a foreman or division superintendent.

will offer H-M drive and definitely meet the demand.

At this point it may be well to devote some attention to the details of the salvage operation. To our best knowledge Livonia contained about 3318 machines. By August 24 the last one had been removed from the wreckage. By that time 2712 machine tools had been salvaged and were enroute either to Willow Run or to a rebuilding source. According to a tally on August 27, 635 machine tools had been junked at Livonia. The actual total of scrapped machines would not be known for some time since some of the machines consigned for rebuilding were expected to be found useless upon examination.

The relatively small number of machines shipped to Willow Run during the initial period comprised those items that had survived the fire and on the surface required only minor repairs and refinishing. It may be of interest that the first rebuilt machine—a 1½-in.



During salvage operations, machine tools lifted from the wreck were lined up in a cleared area while teams of experts made a quick appraisal of damage and decided on the spot what to do with each machine.



Right up to Aug. 24 when the last of salvageable machine tools were en route, heavy duty trucks such as this were dotting the highways with loads of machinery which were found, after examination, to be suitable for rebuilding.



First emergency meeting of top level group in action at Livonia the night of the fire. S. E. Skinner is at extreme right, H. H. Curtice next, Gordon in background, and Goad in center at left.

automatic screw machine—was delivered to Willow Run during the week of August 24 from Chevrolet-Flint.

Salvage operations were handled on a precise military basis. We mentioned earlier that the corporation borrowed a team of 188 specialists from various divisions. The master plan established 38 rehabilitation teams, representing the same number of departments at Livonia, each one headed by a captain, usually the foreman or in some cases a division superintendent.

The day after the fire, 31 GM master mechanics were at Livonia, together with some 29 plant engineers and maintenance experts. These men were assigned to the various teams as consultants. The teams were responsible for on-the-spot inspection of equipment as it was hauled out of the wreckage. Experts on machine tools decided the disposition of each item by quick inspection, and each machine then was tagged as repairable or as junk.

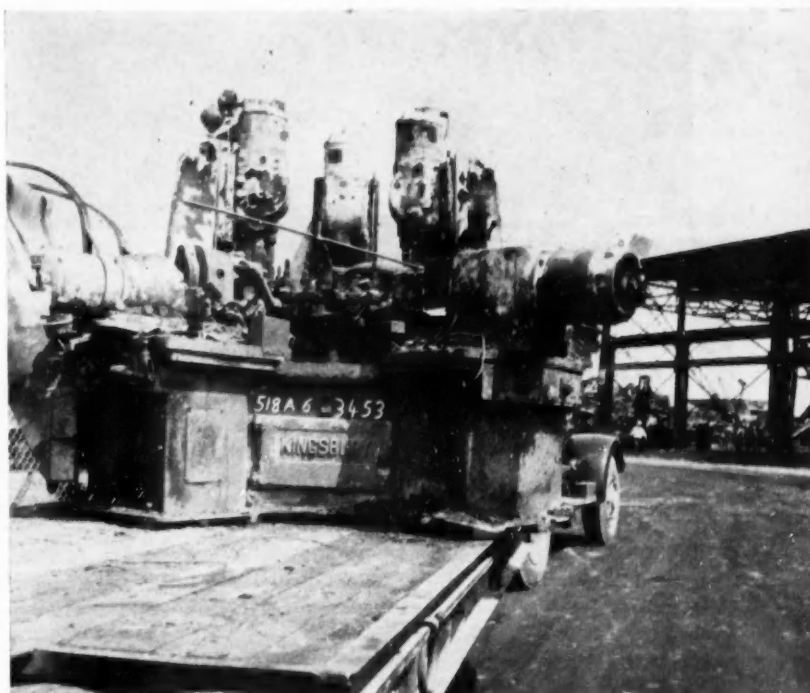
At the same time quick decisions had to be made regarding rebuilding. At last accounts equipment was shipped to some 17 GM divisions, including the huge Fisher Body tool and die shops; and to a group of 166 machine tool builders and other rebuilders located in 51 cities and distributed over 14 states.

Needless to say, wherever possible machine tools were returned to the original producers of the equipment. We understand that the largest number of machines to be consigned to a single manufacturer went to Ex-Cell-O in Detroit who received 204 machines. A sampling of some other well known names is as follows: Bul-lard, Bryant, Barber-Colman, Brown & Sharpe, American Broach, Cincinnati Milling, Fellows, Kearney & Trecker, Kingsbury, Michigan Tool, Pratt & Whitney, Motch & Merryweather, Sundstrand, Gleason, and Gisholt. There are many others, of course, too numerous to list here.

At Livonia, there is a master control board covering all of the equipment, and a total of some 20 expeditors were in the field—as they were during the war — covering the

machine tool builders, charged with turning in daily reports of progress.

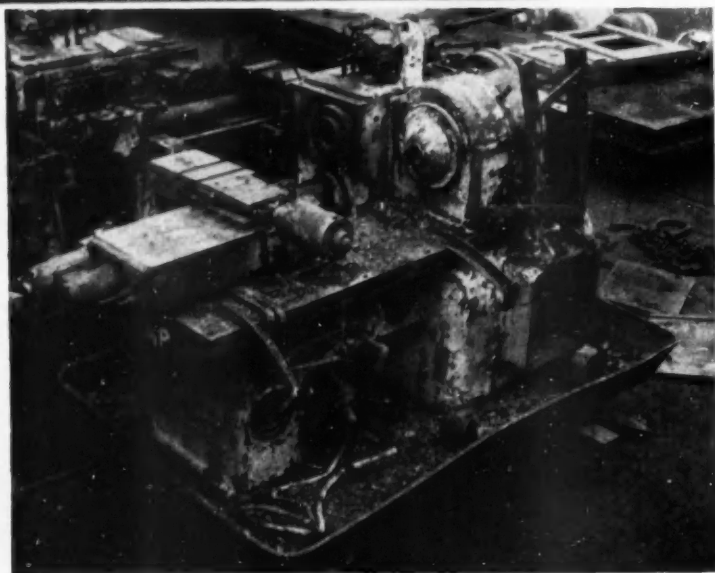
In addition, the highest priced expeditors in the world — the team of Goad, Gordon, Cronin and Klinzler — left Detroit by air on August 31 to blanket the major machine tool plants for direct con-



One of the largest of the machine tools being transported for salvaging is the five-head Kingsbury machine seen here.



Shown here are 41 of more than 50 Gisholt No. 12 hydraulic automatic lathes which were damaged by the fire. As soon as the machines were removed from the plant they were loaded on flat cars and returned to the manufacturer. Here it was found later that more than one out of every three machines was a total loss. Below shows one of the units which was a complete loss and will be cut up for scrap.



tacts with top executives to tack down promises as to delivery of rebuilt machines, as well as to discuss promises on new tools.

Those who witnessed the scene of the disaster will forever wonder how it was that so much of the production equipment was retrieved in reasonably good shape. The fact is that electrical equipment—motors, wiring, controls, did not fare so well. Delco Products, builder of electric motors, entered the breach with a commitment to repair or rebuild motors, and many thousands of motors were on their way to Dayton immediately.

Similarly, the thousands of items of gaging and inspection equipment as well as jigs and fixtures were a total loss. At Willow Run, GM succeeded in leasing the Air Force tool room and equipment and this will

play a major role in producing jigs and fixtures and inspection equipment for the mass production operation.

Whether or not the full story of the disaster will be known is a matter for conjecture. Suffice it to say that on-the-spot news coverage did not get the correct version. One official version given the writer is this: A welder employed by an outside contractor was cutting a return steam pipe located about 15 ft above floor level. As is usual practice at GM several plant protection men were standing by with CO₂ extinguishers. However, the welder was on a ladder whereas the stand-by men were on the floor. Near the steam pipe was a monorail conveyor line, mounted from the ceiling, carrying stampings from a washer. Below the conveyor line was the usual drip pan to catch the drip from the work.

In contradiction to the newspaper versions at the time, no water hose was played on the fire. What happened was this: some sparks from the cutting torch dropped onto the drip pan and started an oil fire. It was a difficult place to reach with fire extinguishers and the fire gained headway quickly. However, the conveyor had been stopped by this time. Within five minutes the fire had reached some power lines, putting the electrical system out of order, stopping the ventilating system. In short order the entire area was filled with dense smoke from the oil and wiring insulation, making it necessary to evacuate everyone

in the plant and making fire protection operations untenable.

Livonia was a relatively new building, representing modern design and construction. It had a steel deck and gravel roof weatherproofed with tar. This doubtless played a major role in spreading the effect of the fire and in the collapse of the entire roof structure, although much of the covering was quite intact after the fire. In any event, this type of roof was said to have been approved by building codes and by the fire underwriters. Perhaps this type of construction will undergo major change in future plants.

Fire walls, where they were practical, were instrumental in saving the main office building, the new office building then under construction, and the executive

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Helicopter Rotor Hub

Features

UNIQUE CONSTRUCTION

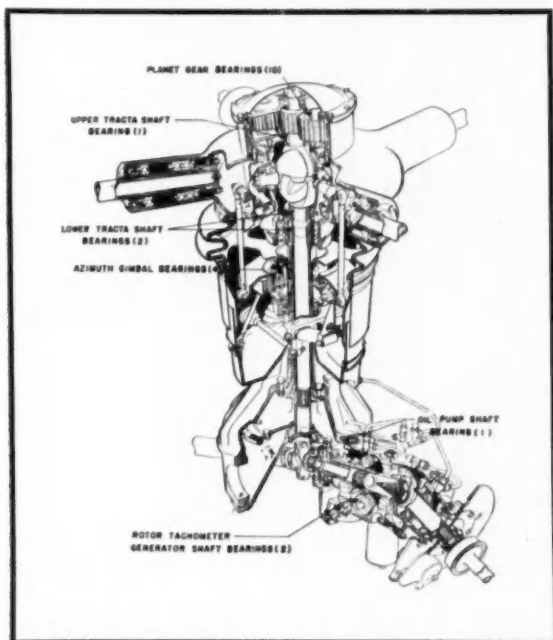


Fig. 1—Main rotor hub of the Doman helicopter showing details of construction and (arrows) the location of Torrington needle bearings.

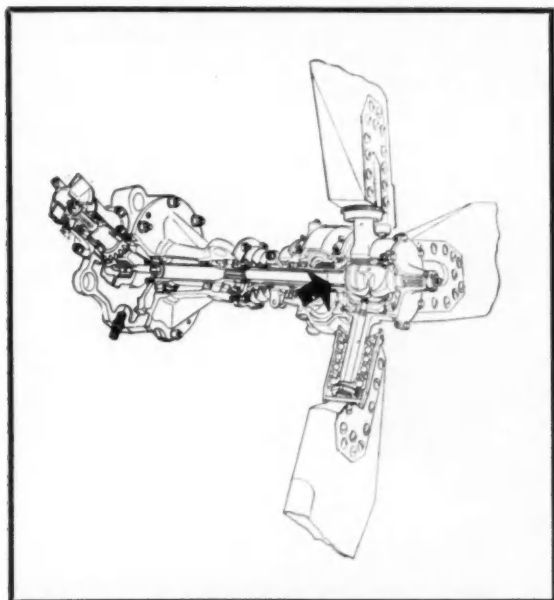


Fig. 2—Tail rotor hub. Compactness and light weight are features of the unit. Arrow indicates location of Torrington needle bearing.

AMONG the features of the Doman helicopter are hingeless rotor blades, and a fluid coupling to engage the rotor system to the engine with an automatic lockout for positive drive under flight conditions. A most important feature is the new gimbal-mounted rotor hub which permits the entire rotor assembly to tip for directed horizontal flight while the fuselage remains horizontal with no dynamic unbalance.

The Doman hub consists of a hollow shell with the components inside, whereas most helicopters have their working rotor parts outside of the hub. The hub is thin, formed of pressed steel, and is designed in four identical pieces which are saddle-shaped and welded together. It is made of an alloy to reduce the weight, and is also heat treated.

The main Doman four-bladed, hingeless rotor system measures 48 ft in diameter with an individual blade area of 18.4 ft. The disk area (the circular area of blade swathe) covers 1810 sq ft, and the effective solidity ratio is 0.0407. The rotor system stands above the ground line 10 ft, three in.

A common housing protects all moving parts from dirt and weather, including the speed reduction gearing, which is an integral part of the rotor assembly. Circulating oil is pumped to all bearing surfaces, eliminating frequent servicing and assuring long life. Inspection and removal of gears are accomplished by removing the cover plates.

The inclination of the single-rotor tip-path plane with respect to the fuselage is accomplished by gimbal-mounting the rotor hub within a convoluted, cylindrical rubber shroud and rotating it with a unique constant-velocity driving system.

No hinges are needed in the blades and bearings which are subject to centrifugal loads with oscillating motion are greatly reduced.

Basically, Doman has two current models; the single and twin engine, each model being of a single main rotor type. The twin engine unit serves for heavy duty jobs. Both types are adaptable to a wide variety

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Latest Developments Displayed at Farnborough Exhibition



Short Brothers research plane for studying swept-back wings.

New British Planes Reach Production Stage

By W. F. Bradley

Special European Correspondent
for AUTOMOTIVE INDUSTRIES

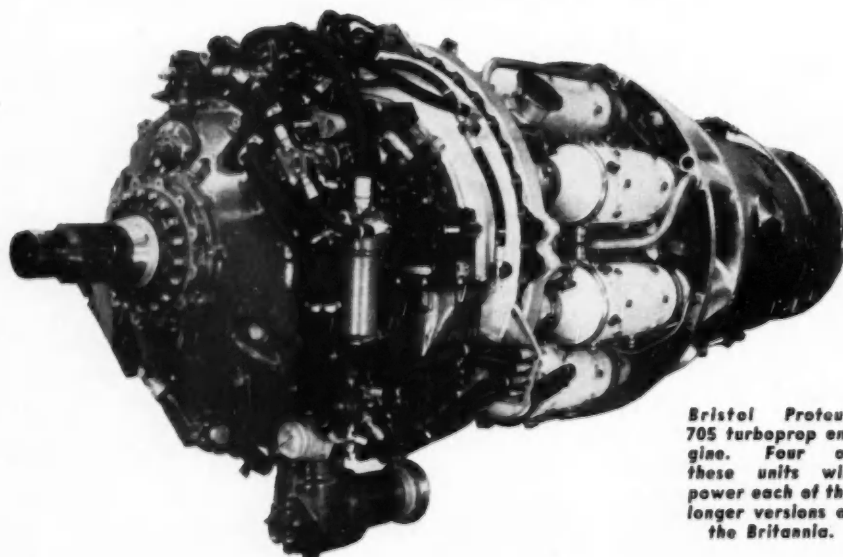
THE Society of British Aircraft Constructors' 14th exhibition and flying display held at Farnborough, September 7-13, emphasized the fact that the production stage has been entered for a large number of new designs. The static exhibition in a big tent covered more than two acres of ground—11,000 sq ft more than last year. In addition, large pieces of equipment were displayed outside. Altogether 240 exhibitors placed their wares on view. Timed to emphasize the importance of this great technical and commercial display was the successful at-

LONDON, ENGLAND

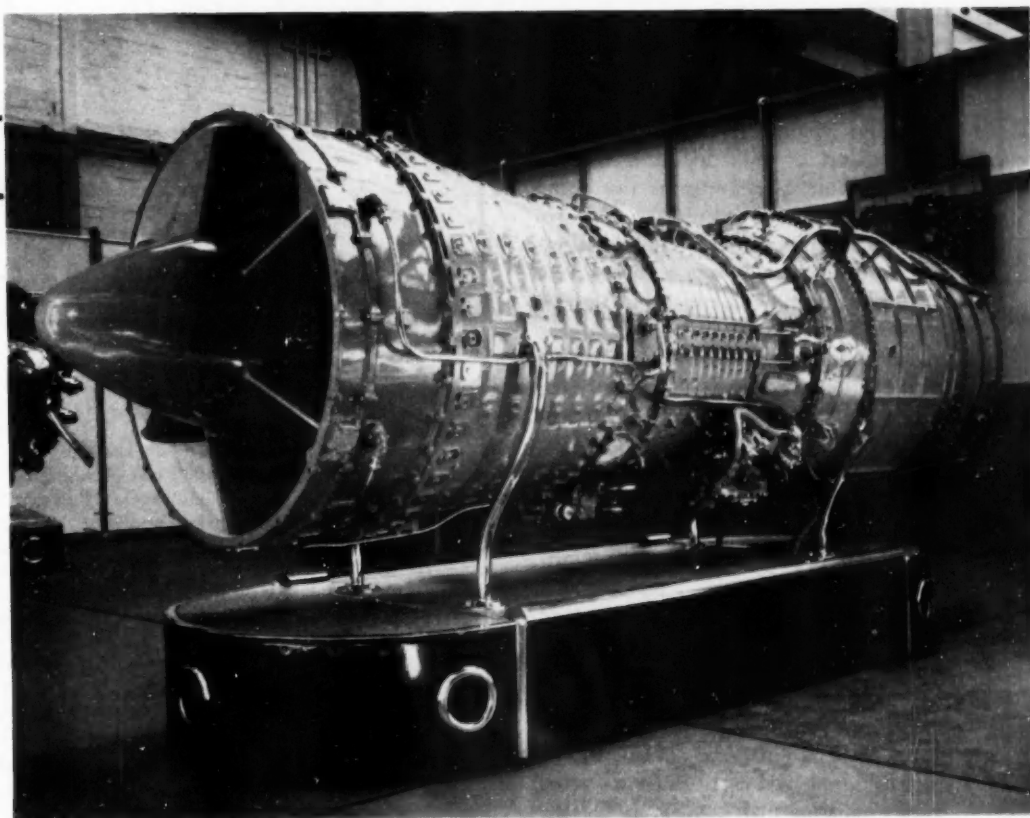
tempt by Neville Duke, at the controls of a Hunter Hawker fighter, to beat the world's speed record at an average of 727.6 mph.

Importance of this exhibition to the nation is shown by a value of £38,000,000 for exports up to the end of July this year, with the probability of better than £60,000,000 being attained for the full year. Workers directly engaged in the aircraft industry, to the exclusion of those on sub-contracts, totaled 218,000 at the end of June. Miles flown by British passenger-carrying planes in 1952 were 1250 millions and freight handled was 30 million ton-miles. Forty-seven licenses to manufacture airframes or engines have been granted in 13 countries.

Significant in the development plan is the extension of the jet-engined bomber and the number of straight or prop-jet passenger liners preparing to go into service at an early date. De Havilland, with Comet Series 1 and 1A now in service, is just getting into production on Series 2 with four Rolls-Royce Avon engines of 6500 lb thrust, while the prototype of the Comet 3 should be flying next year and is



Bristol Proteus 705 turboprop engine. Four of these units will power each of the longer versions of the Britannia.



Super-priority Bristol Olympus turbojet which will be used in the Avro Vulcan bomber.

expected to begin commercial service in 1956.

Bristol's giant Brabazon, after being cocooned for a long time, is now being dismantled, by Government permission, to give room for the super-priority Britannia, which was shown in flight and is just about to go into service with B.O.A.C. This ship has four Bristol Proteus 3 turbo-prop engines and has a capacity for 104 tourist class passengers.

Orders for 50 of these liners are in hand, of which 35 are for the B.O.A.C. There will be three lengthened and more powerful versions of the Britannia, with fuselage extended by 10 ft, three in., gross weight increased to 155,000 lb, and powered by the more powerful Proteus 705 engines.

Vickers-Armstrong presented one of the turbo-

prop Vicounts now in service with Air France. This 40-passenger liner has been in service with B.E.A. since last April and orders for 80 are in hand. It was flown with four Rolls-Royce turbo-prop Darts of 1400 hp plus 365 lb static thrust and in flights with either two or four engines was remarkable for its silent

(Turn to page 116, please)

Avro Delta 707C dual-control research plane. It has a Rolls Royce Derwent jet engine, and is intended to familiarize pilots with delta operation.



AUTOMOTIVE INDUSTRIES, October 1, 1953



Gannet search and strike anti-submarine plane with double-folding wings. United Press photo.

AS the Kremlin Masters continue the relentless drive to boost production of military and civilian goods, their goal remains the same—Communist Supremacy. This report, a warning to the Free Nations to avoid a letdown, was prepared by Dr. Shimkin, a well-known authority on the Soviet economy and author of the article, "What Is Russia's Industrial Strength?", which was published in the August 1 and 15, 1950, issues of **AUTOMOTIVE INDUSTRIES**. In it the industrial power of Russia and her European Satellites was compared with that of the United States, United Kingdom and Canada.

Part I of this exclusive article, which required many months of research, is presented herewith and compares the Soviet Five-Year Plans of 1946-50 and 1951-55. In Part II, which will appear in a forthcoming issue of **AUTOMOTIVE INDUSTRIES**, Dr. Shimkin analyzes the Soviet accomplishments from 1951 to date. He was assisted by Dr. Gregory Grossman, formerly of the Harvard Russian Research Center and now of the University of California.

Dr. Shimkin, who is Consulting Editor of **AUTOMOTIVE INDUSTRIES** on Russian Industrial Affairs, has been associated the past six years with the Russian Research Center at Harvard University. During World War II he was an officer on the U. S. War Department General Staff and since then has been a lecturer on Russian Economic Potential and Strategic Logistics to the United States National War College, Naval War College, Industrial College of the Armed Forces, and Marine Corps Schools. Since 1948 he has prepared for **AUTOMOTIVE INDUSTRIES** and other magazines a number of specialized reports on the Soviet Economy and this year Harvard University Press published his book, "Minerals—a Key to Soviet Power." Material from these articles has been reprinted and broadcast in numerous countries.—Ed.

RUSSIA'S

SINCE 1951, Russia has been engaged in a strenuous effort aimed simultaneously at rapid increases in its levels of military readiness, of industrial capacity, and of consumers' goods production. It has, concurrently, bound its Eastern European satellites to even more ambitious schemes. In pursuit of these goals, the Soviet Union is depending upon many of its established methods, such as a 48-hour compulsory work-week and slave labor discipline. Additionally, it is putting great stress upon differential treatment for the urban as opposed to the rural population, and upon the rationalization and modernization of its construction.

At present, the Soviet economic program as a whole is lagging. While some sectors such as the iron and steel industry are ahead of plan, many lines of producers' and consumers' goods, agriculture and investment have done poorly. The load of armaments has unquestionably been a significant factor.

The lag in Soviet economic development, the turbulence of Eastern Europe, the uncertain demands of China, and—above all—the internal political strains arising from Stalin's death—place serious decisions before the Kremlin. Drastic reorientations of policy may occur, and this possibility should not be dismissed off-hand. This August, significant concessions were given, and more promised, to the needs of the populace. Yet the Soviet armaments effort appeared still to be accelerating at a high rate, with emphasis shifting from conventional to atomic arms. Should the West be weakened by disunity, disarmament or depression, the consequences might be grave.

Five-Year Plan 1946-1950

In the five earlier postwar years, 1946-1950, the main Soviet goals had been recovery from war damage, particularly in heavy industry and railroad transportation; the increased output of consumers' goods, to relieve the extreme distress of World War II and to reduce severe inflationary pressures; the growth of production capacity and the modernization of Soviet technology; and direct military production. A large rise in the labor input, accompanied by repressive labor controls; the conversion of considerable machine-tool capacity from munitions to civilian manufactures, the maximal loading of industrial facilities, plant repair and modernization, and some new construction were the major domestic factors permitting the execution of the Fourth Five-Year Plan. In addition, supplies and equipment received from the Lend-Lease pipeline, from UNRRA, from trade with the West, and—above all—from looted satellites greatly augmented the domestic effort. In consequence, the Soviets were able, between 1946 and 1950, to raise their industrial output (as

STRENGTH TODAY

By Demitri B. Shimkin

Consulting Editor of
AUTOMOTIVE INDUSTRIES
on Russian Industrial Affairs
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determined from mineral consumption and transportation indices) by 75 per cent, to a level 45 per cent above the pre-World War II peak.

Over the same period, the Soviet "Gross National Material Product" (G.N.P. less services) increased about 60 per cent, surpassing the 1940 peak by 23 per cent; and the rise of the G.N.P. may well have been equivalent. Furthermore, the paramount importance of giving the consumer some measure of relief from the abysmal conditions existing at the end of World War II forced a partial redistribution of the national product.

By my estimate, in U. S. 1937 prices, military expenditures remained at a high but stable level between 1946 and 1950. Those for health, education, and miscellaneous government services went up slowly, while gross investment rose between 80 and 85 per cent, and household consumption increased some 90 to 95 per cent. Yet even this partial redistribution left the Soviet Union in 1950 heavily militarized, with an impoverished population.

In comparison with the United States for the same year, Soviet industrial output was a quarter as great; the national product equal to about 28 to 30 per cent American. This latter difference, the allotment to the consumer of a smaller share of the country's G.N.P. than in the United States, and a larger population combined to yield a privately disposable per capita income equivalent to only 15 to 16 per cent American. Yet, at the outbreak of the Korean War, the Soviet Union was maintaining in its armed forces (including MVD troops) three times as many men as did the United States.

Fifth Five-Year Plan 1951-55

The Fourth Five-Year Plan ended in 1950, but through 1951 and the first half of 1952, the new Soviet economic targets remained undisclosed. Finally, in late August, 1952, a tremendous program, the Fifth Five-Year Plan, was announced. This program, like the Fourth Five-Year Plan, anticipates forced-draft economic growth. It differs from the latter, however, in its extreme emphasis upon military expenditures and war-supporting industries.

Between 1951 and 1955, the Soviets plan to increase Russia's Gross National Material Product in constant prices by 60 per cent, thus equalling the achievement of 1946-1950. The structure of expenditures is, however, to change radically. Spending on the armed forces and atomic energy is to double, essentially matching the American effort of 1952-1953, and gross investment is to rise 85 to 90 per cent. Personal consumption is to increase 45 per cent or half the 1946-1950 rate. For gross industrial output, the target for 1951-1955 is a 70 per cent rise, with individual goals being even higher:

for aluminum, 160 per cent; for lead, 170 per cent; and for petroleum-cracking capacity, 170 per cent. Machine-building, the dominant Soviet manufacturing group in terms of value of product and employment, is supposed to double its output. Yet, of its civilian divisions, machine-tools alone are to rise 160 per cent, while the goal for motor-vehicle and tractor production is a modest 20 per cent increase, and none whatsoever has been announced for locomotives and rolling stock. From this evidence, the military orientation of the tremendous Soviet industrial program is indisputably clear. At the same time, the 120 per cent targeted increase for cement production reflects the rapidity of contemplated new construction. The major undertakings in construction center around large, low-level, multi-purpose dams and hydro-

THE memory of highly creditable Soviet war production between 1941 and 1945, coupled with postwar economic growth, and with Soviet capabilities of seizing the productive plants of Continental Western Europe, forbids complacency towards the potential military challenge of Russia's economy.—from "What Is Russia's Industrial Strength?", August 15, 1950, **AUTOMOTIVE INDUSTRIES**.

electric stations on the Volga (Kuibyshev and Stalingrad), with an aggregate planned capacity of 4.2 million kw. Scheduled for completion in 1956, this group of dams and stations and the related canals, irrigation projects and power lines are to serve as the foundation for the integrated development of Central Russia, the Volga, the Urals, the North Caucasus, and the Ukraine.

In agricultural production, the overall goal for the U.S.S.R. is a 40 per cent rise, with technical crops such as cotton increasing 60 to 70 per cent; livestock, an average of 20 per cent. Production figures for individual crops, etc., will be presented in Table I which will appear in Part II of this article. (Continued on next page)

RUSSIA'S STRENGTH TODAY

continued

Basic Economic Methods

So much for current plans. Let us now consider how the Soviets hope to achieve them. Continuing methods, methods used in 1946-1950 but no longer applicable, and new methods must be distinguished.

Soviet personnel policies manifest important continuities. No evidence of any lowering of compulsory work hours or of any relaxation of labor controls has been found. At the same time, the intense effort toward improving technical education is continuing. In 1937, the professional labor force included about 170,000 graduate engineers and natural scientists in manufacturing, construction, transportation, and communications, plus some 70,000 in agriculture and forestry. By mid-1952, the corresponding numbers had risen to 475,000 and 145,000. The goals for 1955 are approximately 675,000 and 180,000, somewhat exceeding current United States figures. The 1950 number of graduate students working for strictly research degrees (Kandidat and Doktor) is to double by 1955 to 42,000.

In technology, the old policies of the maximum loading

specialized types has been designed and partly brought into production.

While much recent development in the fields of higher-speed machining and automatization has involved relatively simple modifications and additions to existing equipment (carbide instead of high-speed steel bits, automatic clamps and conveyors, etc.) the Soviets are introducing a fair number of specialized machine tools capable of complex simultaneous operations. The pattern of borrowing from abroad is accompanied by increasing redesign. For example, the Stalinets-80 tractor is a copy of the Caterpillar D-7 remodeled to metric dimensions (see "Russian Tractors—or Potential War Machines?" Feb. 15, 1953, issue of *AUTOMOTIVE INDUSTRIES*). Again, the Soviets are now approaching the serious problems of overweight in their manufactures through the basic redesign of components, with the lightening or elimination of metal sections not subject to stress.

Another interesting project, as yet also at an early stage, is the reduction of waste in the utilization of sheet and plate steel. The essential steps in this project include

New Cast Iron Development

Low-sulfur iron (under 0.14-0.12 per cent S), normally with 3.4-3.6 per cent C, 3.2-3.4 per cent S and either 0.4-0.6 per cent Mn (for ferritic products) or 0.6-0.9 per cent Mn (for perlite) is heated in a furnace to 1390-1450 C. To it is added magnesium as pure metal or ligatured to ferro-silicon, optimally totaling 0.26 per cent by weight of the cast iron. The reaction is violent and lasts 1.5 to 3 minutes, at the end of which a residual of 0.05-0.08 per cent Mg is retained by the iron. The temperature must not drop below 1200 C.

This process transforms the graphitic inclusions in the

iron to spheroidal shape, and greatly improves both malleability and hardening properties, so that they correspond essentially to those of silica steel of the same composition. Further improvements in properties can be gained by suitable alloying and heat treatment. (Vashchenko et al.)

On the basis of recent tests, the Soviets claim that magnesium-modified cast iron is a superior material for manufactures as diverse as piston-rings and 40-ton castings for large machine-tool stands. However, the problems of the large-scale production of this material have not yet been solved.

of capacity, of minimizing the variety of types, of stressing interchangeability between civilian and military production, of minimum changeover and maximum use of obsolescent models, and of heavy dependence upon foreign prototypes are still dominant. At the same time, indications of more progressive trends must not be overlooked. In agricultural and in construction machinery, for example, a considerable though as yet inadequate variety of

the determination of the geometrical shapes used in machine-building, the standardization of cutting patterns to maximize the recovery of frequently-occurring shapes from each size of sheet and plate, and the development of inter-plant cooperation insuring the appropriate, regular flow of by-product shapes.

Only the first step has been completed. The analysis of 10,000 patterns utilized in Soviet machine-building re-

cently permitted Pribs and Gerich to establish nine classes and 52 sub-classes of geometrical shapes embracing 95 to 97 per cent of all production. In addition, the Soviets are continuing to stress work in casting, a field of extreme importance in minimizing investment, power and labor consumption in metal fabrication, and one in which they have done much original work. The most important phase of their research and development in casting centers currently on cast iron modified by magnesium, substituting for ultra-scarce molybdenum.

Finally, difficulties in quality-control, in substandard production, and in maintenance continue to plague the Soviets. While some progress, such as growing acceptance of sampling rather than 100 per cent check in quality control, is being realized, equipment breakdowns and inadequate repair are today major bottlenecks in the use of automatic manufacturing and heavy construction machinery. In all, the technology of Soviet manufacturing maintains its distinctive characteristics but is by no means static.

Conditions Changing

Several economic methods of great importance between 1946 and 1950 are of far less importance today or no longer feasible. At present, although the armed forces are at high strength, possibly 5.5 million including MVD troops, the manpower pool available to the economy through their reduction is far smaller than in 1945-46, when some 8.5 to 9.0 million men and women are demobilized. In fact, the current Soviet plan anticipates only a 15 per cent increase between 1950 and 1955 in the number of workers and employees, and stability in the number of collective farmers.

Production increases are to be achieved by a 50 per cent gain in the productivity of industrial labor, a 55 per cent productivity rise in construction, and one of 40 per cent on the collective farms. Furthermore, the Soviets face great difficulties in realizing today as high a return from their investment as they did in 1946-1950. Thus, except for the consumers' goods industries, the low-cost measures for increasing plant output (conveyor systems, coal-washing units, etc.) have already been widely installed. In addition, the substantial part of the Soviet industrial plant, which was constructed before 1932 or, in the case of consumers' goods industries, before 1917, and which has been continuously overloaded since, needs early replacement.

In agriculture, too, capital demands are high. By 1951, acreage under cultivation had been restored to pre-war peak levels. Further expansion, with Russia's shortage of good land, demands costly irrigation or drainage, and extensive fertilization.

Finally, even prior to the widespread disturbances in Eastern Europe this spring, the Soviet Union's relation to the satellites has been undergoing considerable change. Since 1948, the earlier policy of looting has been increasingly replaced by programs of intense industrialization to provide a western logistical base for the Soviet empire, to furnish raw materials (e.g., uranium, zinc) and manufactures (e.g., optical goods) scarce in the U.S.S.R., and to support the shaky local economies. While the products of this industrial development have been, in considerable measure, for the Soviet account, the weakness of the satellites in raw materials and—after World War II and Soviet occupation—in capital stocks has necessitated a significant outflow of resources from the U.S.S.R. to East-

Joint Plan of Industrial Designing

In metallurgy: type complexes for blast furnaces of 1033 and 1386 cu m capacity; a type complex for an open-hearth shop with 220-mt furnaces; a four-battery coke-chemical plant; type departments and sections of the rolling and pipe-rolling mills of a steel combine; metallurgical-plant repair shops; the main structure of an agglomeration plant, etc.

In the fuel industry: a coal shaft of 300,000 mt annual capacity for the Moscow Basin; surface units, grouped in two or three buildings, for coal shafts of 300,000-1,200,000 mt annual capacity, with a high level of the mechanization and automatization of basic and auxiliary processes, for the Donets, Kuznetsk, and Karaganda Coal Basins; coal-concentration plants with remote and automatic control; petroleum - prospecting and oil-well drilling installations; base machine shops; re-circulating water-supply and purification units for petroleum refineries.

In energetics: the main structures of thermal power stations of 300,000, 200,000, 50,000, 24,000 and 8,000 kw capacity; two—"locomobile" power plants (cart-mounted, steam-piston units for collective farms); compressors with capacities of 120 and 500 cu m/minute of air, etc.

In machine - building: shops for rolling sheets from liquid pig iron; foundries of 5000 and 10,000 mt iron-casting capacity annually; type-sections for multiple-story industrial buildings for light machine-building, etc.

In chemistry: contact - process sulfuric acid plants; granulated superphosphate plants, etc.

In light industry: a clothing factory of 600 sewing machines; a shoe factory of 4.5 million pairs annual capacity, and type sections of a cotton-cloth mill.

In the food industries: meat combines, fish combines, butter plants, condensed milk plants, bakeries with two and three ovens, starch-treacle plants, plants for non-alcoholic beverages, etc.

In building materials and construction: the main structure of cement mills with two and three rotary ovens; the main structure of a silicate-brick factory with 120-million-piece annual capacity; a shop for firing ceramic sewer pipe; operating headquarters for a construction trust with a program of 100 million rubles; a two-section concrete-mixing plant; base machine shops for a construction trust, etc.

In transportation and communication: all-welded, 18- and 45-meter span railroad deck-bridges; riveted, 33- to 110-meter span, railroad through-bridges; a railroad station of 50-100 passenger capacity; locomotive shops; garages for 100 vehicles; regional communications offices; telephone stations, etc.

In housing: type sections for eight to 14 and 6-7 story communal housing; series designs for four to five and two to three story units; standard pre-fabricated wooden houses; type schools, hospitals, creches, kindergartens, theaters, libraries, etc.

In agriculture: hot houses, cowbarns, silos, irrigation and drainage networks, etc.

RUSSIA'S STRENGTH

TODAY

Continued

ern Europe. For this reason, the hegemony over Eastern Europe represents a diminishing net profit.

Attention should be paid to two approaches which have gained especial significance since 1950. The first is the compartmentation between the urban and rural sectors, with the former receiving highly preferential treatment. The second is the vigorous campaign to rationalize and modernize Soviet industrial construction, the chief means today of expanding production.

Discrimination Among Groups

The policy of compartmenting the economy into sectors of higher and lower priority, with corresponding access to capital, labor and materials, has been basic to Soviet planning and administration for more than 25 years. The broadest divisions, which derive from Marxist theory, have been between government and defense, material production (industry, agriculture, construction, freight transportation, etc.), and "non-productive" services (health, education, passenger transportation, etc.). Within industry, every plant is distinguished as being primarily for the manufacture of producers' (Group A) or consumers' (Group B) goods. Group A plants receive highly favored treatment.

The low status of the peasant is inherent in the Marxist dogma, and discrimination against him has long been in evidence. For example, education beyond the fourth grade has been limited almost wholly to urban areas. Yet, since 1947, the differentiation between the salaried and wage-earning population and the collective farmers has grown. The former, who comprise not only urban dwellers but also workers on Machine-Tractor Stations and State Farms, commercial fishermen and lumbermen, and various other groups totaling about 43 per cent of the civilian population, have been the special beneficiaries of the six price cuts on consumers' goods promulgated by the government since 1947. On the one hand, they receive all their earnings in cash, as opposed to the collective farmers, half or more of whose earnings may be in kind. On the other hand, these cuts have depressed the prices which the collective farmers have been receiving from the sale, on the open market, of produce from their private plots.

Furthermore, in recent years, the entire government investment in housing, utilities, hospitals, schools and comparable facilities—an outlay constituting about 20 per cent of Soviet gross investment—has been devoted to urban areas. That is not all: the Soviets have been squeezing the collective farmer increasingly. Since 1949, failure

to meet the high goals for the increase of collective-farm livestock numbers has been penalized by withholding from the farmer's meager earnings, sums adequate to buy the livestock. Since failure has been general, this measure has acted to force the surrender of individually-owned livestock, and as an additional tax. Beyond this, the collective farmers have been engaged in an extensive tree-planting program. Within the last two years, each collective farm has had to organize and maintain a permanent building gang or "brigade" to construct livestock accommodations, silos, irrigation and drainage networks, headquarters for the Communist Party and the local government, schools, garages, and—in lowest priority—barracks and huts for housing.

A measure of the immense differences in the values placed by the Soviet government on industry, the urban population generally, and the collective farmers is shown in the equipment made available for three construction programs. For the earth-removal operations of the Volga-Don canal, the Soviets allocated, in 1950-52, 346 power shovels, 900 earth-scrappers, 300 bulldozers, 37 mud-pumping assemblies, and several thousand 3.5 to 25-ton trucks. With almost complete mechanization they were able to move 152 million cubic meters of earth in two years. In contrast, the total equipment available for the rebuilding of Vyazma, a war-damaged town of some 30,000 persons 130 miles WSW of Moscow, consisted, in July, 1953, of "a few" cranes, three belt conveyors and 17 trucks. Almost all operations were manual. The reconstruction of the town is still largely unfinished, eight years after the end of World War II. Finally, the collective farmers rarely have more than hand-tools, block-and-tackle, and a few horses available. In fact, an article in the journal *Sel'skii Stroitel'* (1952 No. 6, p. 10) begins. . . . The best floors for swine brood-pens are wooden. But many collective farms do not have planks and nails in the necessary quantities. . . . It ends up by detailing instructions on how to do without such luxuries.

The whole situation may be summed up in one contrast; in industrial construction, the average daily wages run from 38 to 45 rubles; in collective-farm construction, eight rubles is the typical wage used for current cost-accounting.

What advantages do the Soviets hope to gain from their system of economic compartmentation, particularly that between the urban and rural sectors? One objective is to maximize industrial output at least short-run cost. With desperately little housing (an average of three persons per room) and with overloaded utilities and other facilities, it is cheaper for the Soviets to concentrate on increasing the productivity of the present urban labor force than to build accommodations for new migrants to the cities. Furthermore, it is easier to train the existing, experienced labor force in the use of more advanced machinery and methods than to educate raw labor from the farms. The results thus far have been marked, with annual productivity increases since 1950 running 5 per cent to 6 per cent annually even in U. S. values. A second objective has been to insure the loyalty of urban labor as a bulwark for the regime, developing simultaneously a deep economic, social and psychological cleavage isolating the farmer, ever suspect for leanings toward individualism and private property. A third objective is to create a strategic maneuverability of the country's manpower. Thus the permanent construction "brigades" of the collective farms are organized detachments, divorced from the job of direct food production, which can be quickly mobilized for pressing industrial or construction work, or for war.

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Legal Codes Affecting Car Air Conditioning Need to be Modernized

SUPPOSE it were found that dealers and service stations could be compelled to hire a licensed refrigeration contractor to supervise all manner of service, including engine maintenance and spark plug adjustments on automobiles equipped with air conditioning systems. And suppose further that even motor car manufacturers might have to do the same thing. That would be news indeed! Peculiarly enough, it could happen.

That was the practical situation facing the Automobile Manufacturers' Association (AMA) early this year. Air conditioning caught on in a big way from the standpoint of public acceptance when leading companies in the industry made factory installations available on 1953 cars. Cadillac, Oldsmobile, and Buick in GM offered Frigidaire equipment; Chrysler Div., DeSoto, and Dodge supplied a special Airtemp unit; Packard came in with a special Frigidaire unit; and more recently Lincoln-Mercury announced adoption of a newly developed, compact unit produced by Novi.

It would be difficult to estimate the number of air conditioning units now riding the highways all over the USA, since many installations were made in the field by independent parts companies in regions such as Texas, for example. A quick estimate of factory installations by the end of 1953 places the number at around 35,000 units.

Although the present high cost of an installation, ranging upwards of \$600 in some instances, will naturally limit the number of cars that will be equipped, it is anticipated that by 1954 even some of the lowest priced cars will offer air conditioning.

In any event, air conditioning became big business almost overnight. And from the standpoint of the industry, as represented by AMA, it became a problem of national significance since it involves questions of public safety.

AMA proceeded to make a complete survey of the situation, convinced that public safety would require regulatory measures on a national and state level. Study of existing regulations showed there were no state statutes governing installation or use of air conditioning in automobiles, with the possible exception of California.

On the other hand, at least forty cities were found to have ordinances regulating installation and servicing of air conditioning equipment. Although these

By Joseph Geschelin

ordinances were written before car air conditioning was an accepted fact, they are so broadly worded as to have potential power of being applied to motor vehicles as well.

As a matter of fact, Detroit is one of the cities having an ordinance of this character and it was ruled immediately by the Corporation Counsel as being applicable to motor vehicles as a matter of strict legal interpretation.

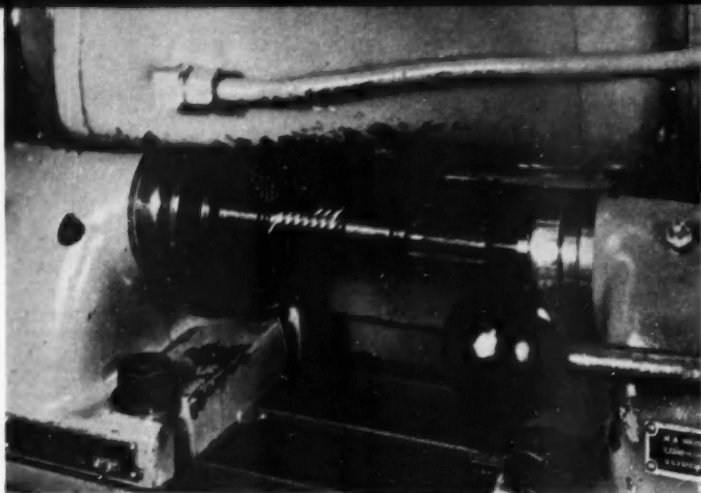
Fortunately, Detroit is the center of motor car activity and the Mayor, the Common Council, and City Engineer were both sympathetic and understanding of the problem. AMA held meetings with city officials and had no difficulty in convincing them that car air conditioning should be exempted from the Code for many good reasons to be developed later.

In fact, the City Engineer took the initiative in preparing an amendment to the Code and presented it to the Common Council for action. As is usual in matters of public concern, Common Council held open hearings on the subject before taking action one way or the other. It was at this point that organized opposition became crystallized. The amendment was strenuously opposed by organizations of refrigeration contractors not only at the city level but from national headquarters, reinforced by presentations from union labor.

Not even the well documented AMA presentation was able to shake the unyielding stand of these special interests. Nevertheless, the Common Council recognized the basic problem and saw clearly that automobiles should be exempted from the provisions of a Code designed for stationary and more or less permanent installations applicable to stated occupancy definitions. And despite the objectors, it did approve the amendment unanimously.

Although Codes and actions on matters of public interest differ in different communities, dealers and service establishments all over the country must be

(Turn to page 102, please)



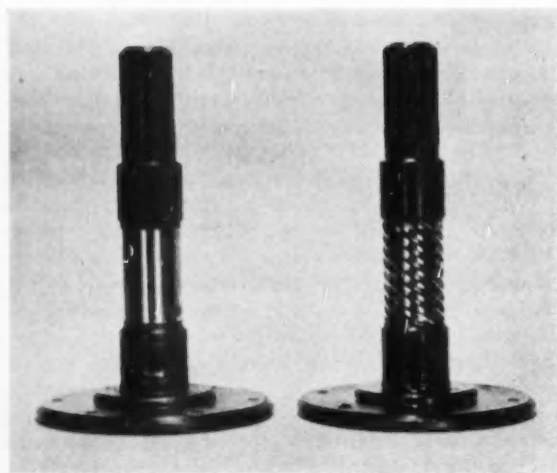
Close-up of work station of National Breach Red Ring diagonal gear shaver as it is set up for shaving the output shaft gear.

By C. R. Moore
Master Mechanic
Chevrolet-Cleveland Div.,
General Motors Corp.

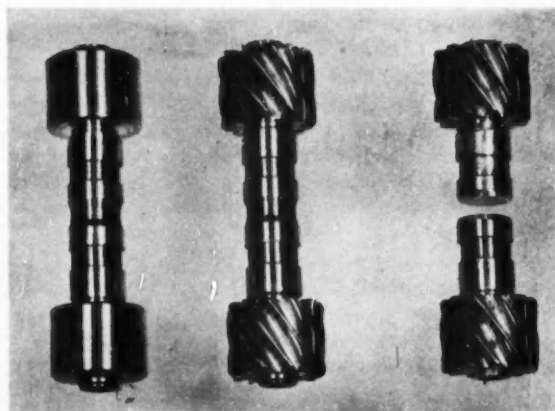
Powerglide Governor Gears Produced by Advanced Methods

AN unusually interesting, if not difficult, problem was presented in the development of methods for producing the pair of gears for the governor drive of the Chevrolet Powerglide transmission at the start of 1953 production. From an engineering standpoint, the problem was one of fitting a pair of

helical gears within a limited space and without affecting the other transmission details. This, together with a specific gear ratio, more or less defined the gear centers as well as the maximum diameter of the driving gear on the output shaft, since the driving gear is cut between the bearings and must pass freely through



Powerglide output shaft, before and after cutting the gear.



Detail of bronze governor gear. At the extreme left is the double-end blank designed to facilitate chucking. In the center is the blank after cutting gears at both ends. At right, same blank cut apart to form two governor gears.

the bearings at the time of assembly.

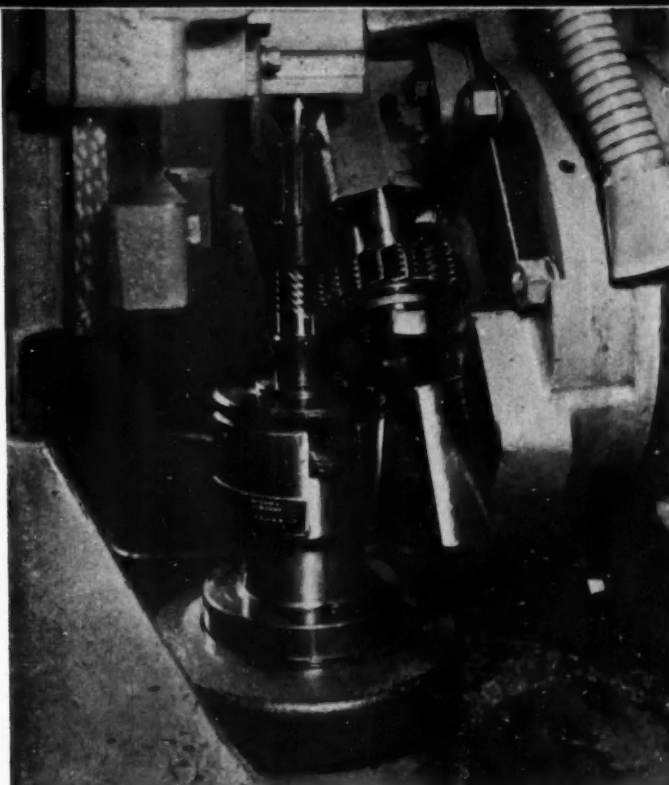
After considerable study and experimental work on the part of both engineering and production departments, the gear data were finalized in the form given in this article, using a driven gear of special bronze alloy for compatibility. Examination of the gear data will show that the driving gear on the output shaft has an unusually steep helix angle, thus posing a special problem both in gear cutting and finishing. Since it was found that gear accuracy and surface finish had to be of a high order of perfection to promote adequate life of the mating bronze gear, the gear blank on the output shaft had to be hardened before gear cutting.

Significant gear data on the output shaft gear are as follows:

| | |
|---|---------------------------|
| No. teeth | 10 |
| Normal diametral pitch | 18 |
| P.D. | 1.0625 in. |
| Normal pressure angle | 20 deg. |
| Helix angle | 58 deg, 28 in, 28 sec, LH |
| Addendum | 0.01475 in. |
| Full depth | 0.11975 in. |
| Total transverse backlash, when meshed with mating gear on 0.8897 in. centers | 0.0036-0.0096 in. |

With these requirements in mind, the production setup was designed to heat treat the output shaft blank following preliminary machining, using a Tocco induction hardening machine for the purpose. The gear blank then is ground on the OD in a Norton grinder and gear teeth cut on a Cleveland eight-spindle hobbing machine. The requirements of accurate spacing and tooth profile combined with perfection of surface finish made it imperative to shave the gear teeth after hobbing. This is done in a National Broach Red Ring diagonal shaving machine. It will be noted, however, that production shaving normally is done in the green in general practice. Consequently the shaving of surfaces having a hardness ranging from 32 to 36 Rc posed a problem of unusual difficulty from the standpoint of shaving cutter life as well as cycle time.

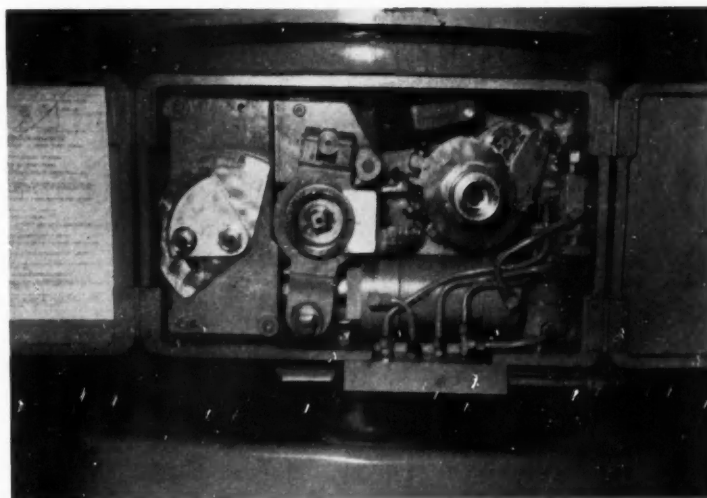
Although it was necessary to employ a conventional Red Ring diagonal shaving machine at the start of production, the operation now is being handled on a new type of Red



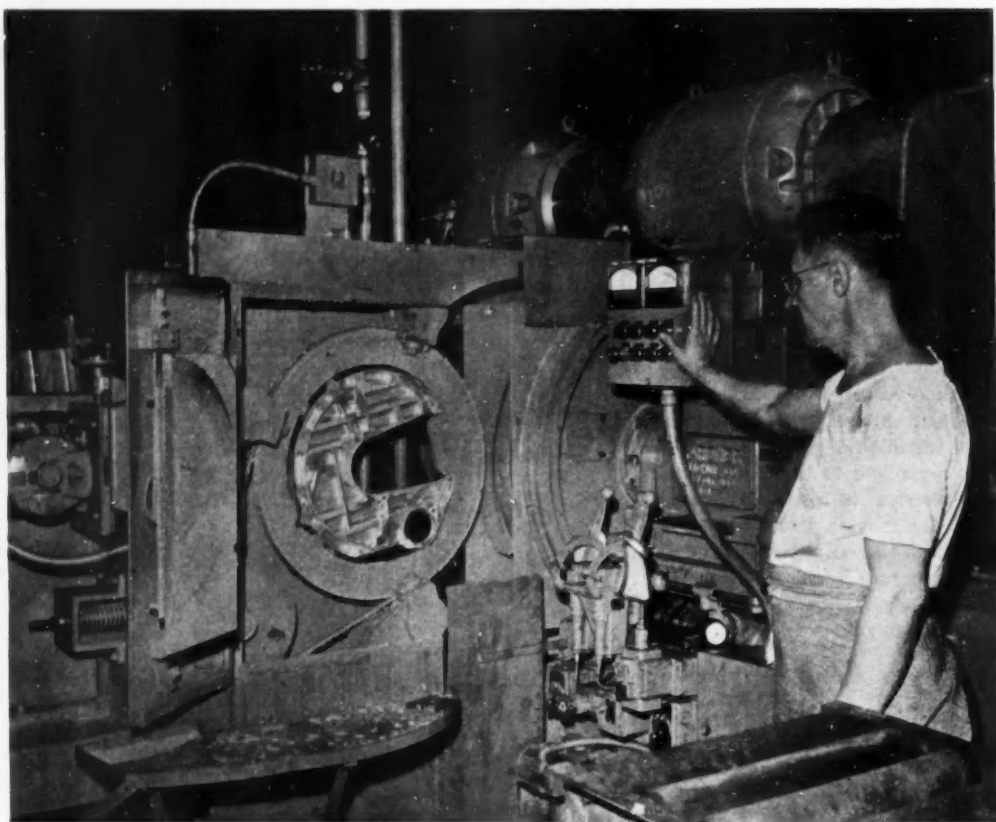
Close-up of one of the stations of the Cleveland hobbing machine to show the relations of the four-in diameter hob to the output shaft.

Ring diagonal shaver made available very recently. This machine differs from the familiar Red Ring shaving machine in that it is fitted with what is known as the differential up-feed attachment. In principle, the

(Turn to page 100, please)



This is a view of the control cabinet, a feature of the new Red Ring diagonal shaving machine, which provides the differential up-feed. The control mechanism is cam-operated, the arrangement of cams and their adjustment being shown here.



This is the Gardner two-spindle horizontal surface grinder for finishing the sides of the adapter plate. The aluminum adapter is shown mounted in the keeper which is driven by V-belt.

... AUTOMATION... applied to

Automatic Handling of Engines Combined with Automatic Balancing at DeSoto Engine Plant. Torque Converter Adapter Plates and Flywheel Housings Made of Aluminum Precision Castings to Reduce Weight and Simplify Machining Operations.

TAKING advantage of light-weight design, DeSoto has placed in production two large aluminum parts for its V-8 engine—the torque converter adapter plate and the flywheel housing—the plate being made by permanent molding while the housing is a die casting. These precision casting methods produce parts, in the rough, that are true to form, uniform in section, and with a minimum of excess metal where machining is required. In addition, numerous cored holes are held true to location about the bolt

circle. In the case of the housing, with its multiplicity of attachments to the engine, it remains necessary only to ream several dowel holes while the rest of the holes are used "as cast."

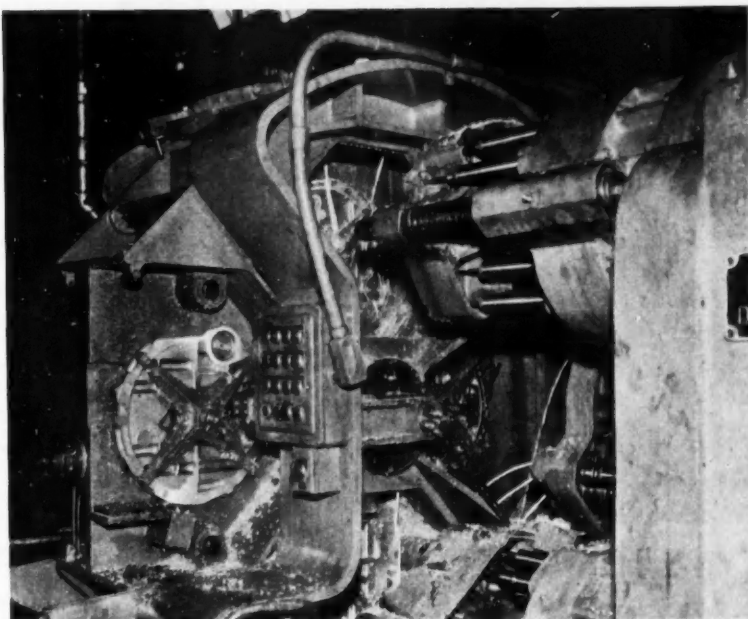
Besides these known features of permanent mold or die castings, cooperation of engineering and production tooling departments has developed the design of both parts in such fashion that only two major machine operations are required to finish each part. This marks a fresh approach to the machining problem,

with resulting economies in floor space, equipment, and overall cost.

From its very beginnings the DeSoto V-8 engine plant bristled with "firsts" in equipment and techniques. More recently the management placed in operation another "first" — an advanced version of the unique Gisholt Dynetric balancing machine in which the complete bare engine assembly together with torque converter is balanced at both ends, total balance being held to a tolerance of $\frac{1}{2}$ oz in. As a matter of fact, the machine is said to be capable of holding balance to $\frac{1}{4}$ oz in. if desired.

Although this machine is not new in operating principle, it does represent an entirely new model and is a "first" in the application of automation to this type of equipment. Three of these units have been installed parallel to the DeSoto engine assembly line, their combined capacity exceeding 100 engines an hour.

As illustrated, the machine is provided with transfer equipment consisting of a track and a carriage



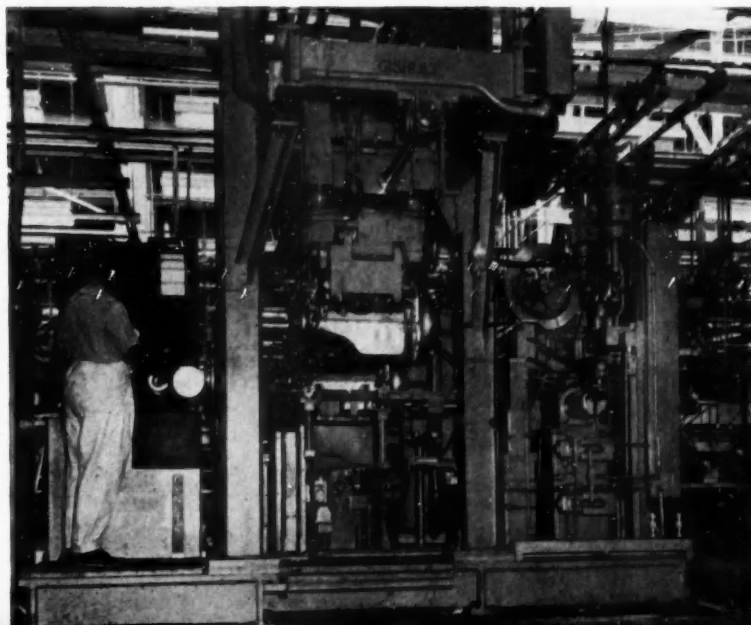
Trunnion type Michigan Drill Head special machine of four-station type is tooled for drilling, reaming, and tapping of adapter plates as described in text.

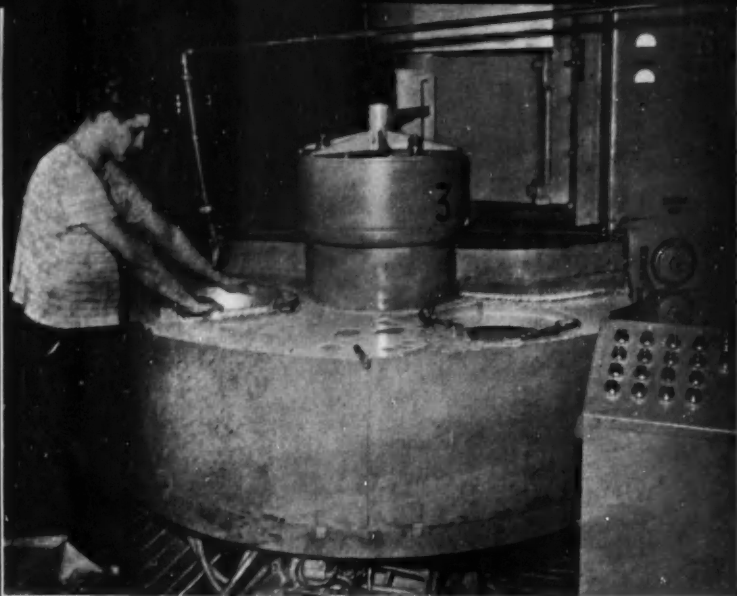
carrying two pairs of hydraulically-powered hooks. Automatic control of the transfer cycle is arranged for the following events: starting with a balanced engine in the cradle, the operator presses the "load" button to initiate the new cycle. At this stage the outer hook is holding an unbalanced engine, having lifted it off the feeder conveyor. At the same time the inner hooks have been lowered in position to grip the balanced engine in the cradle. As the "load" button is pressed, the inner hooks close about the engine and

Engine Balancing Equipment

By
**Joseph
Geschelin**

One of the enormous Gisholt Dynetric balancers for balancing the De Soto V-8 engine and torque converter assembly. The transfer mechanism for handling engine assemblies in and out of the balancing machine may be seen in the center. To the right, near the upper portion of the machine is the reel, holding strip stock for the balance weight on the torque converter end.





Aluminum flywheel housings are ground flat, simultaneously, on both ends in this vertical two-spindle Gardner grinder. The fixture seen here holds three parts at a time.

raise it out of the cradle. The carriage then traverses to the rear. This brings the unbalanced engine over the cradle in the machine while the outer hook carries the balanced engine to the conveyor serving the assembly line. The engine is then lowered onto a loading jack in the machine, the hooks open to release the engine and are raised to clear the engine. The carriage then travels to the extreme rear position to move the previously balanced engine over the conveyor in position to release it onto an empty fixture.

The outer hooks open to release the engine, then are raised into the up position. As soon as the hooks are clear the carriage is traversed at high speed to the other end of the machine ready to pick up another unbalanced engine.

Balancing is done at both ends—by drilling in the vibration damper and by welding a metal strip to the torque converter housing to complete rotating balance at the outer end.

For this operation, a driving adapter is coupled to the belt pulley end of the engine and the engine is automatically

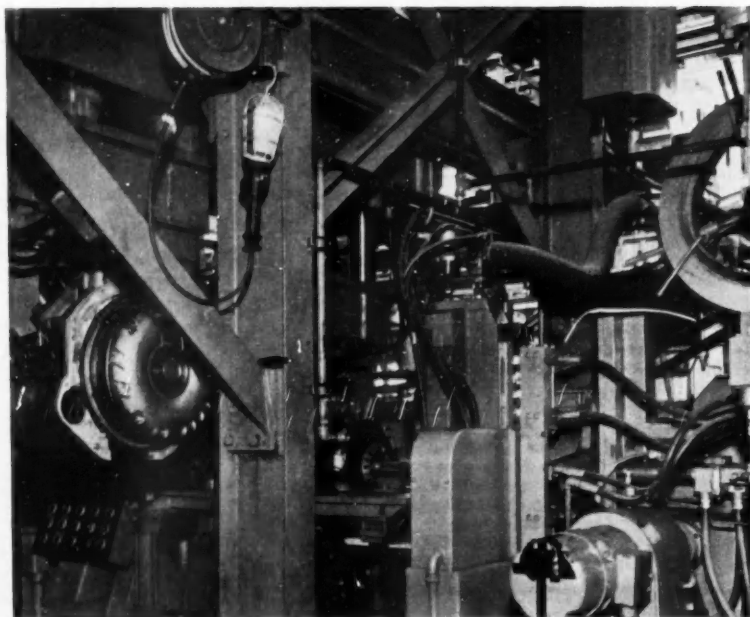
lowered and clamped to the cradle by hydraulic means. The operator then pushes the start button, permitting the engine to be rotated at 400 rpm. This speed is below the coupling speed of the converter; the driven parts of the converter being held against rotation by an arbor. The amount and location of unbalance at the torque converter end then are read and recorded on a "dummy" dial, the amount of unbalance being automatically recorded within a "memory" unit in the welder control.

Following this the amount and location of unbalance at the vibration damper end are determined and the required drill depth reading is recorded in the drill brain memory unit. The operator then stops the machine, indexes the rotating mass to the location of unbalance in the vibration damper and presses the drill button. The correction is made automatically by means of the controlled drill head located underneath the machine.

When the drill button is pressed it also initiates the events in preparation for the welding cycle. Thus the correction strip is metered off the reel, the strip being fed through a series of rollers, first to straighten, then to form it to the radius of the housing.

(Turn to page 130, please)

Close-up view of the Gisholt balancing machine shows an unbalanced engine on the transfer mechanism at the left. In the center may be seen the torque converter of an engine still in the balancing cradle. The reel is at the extreme right.





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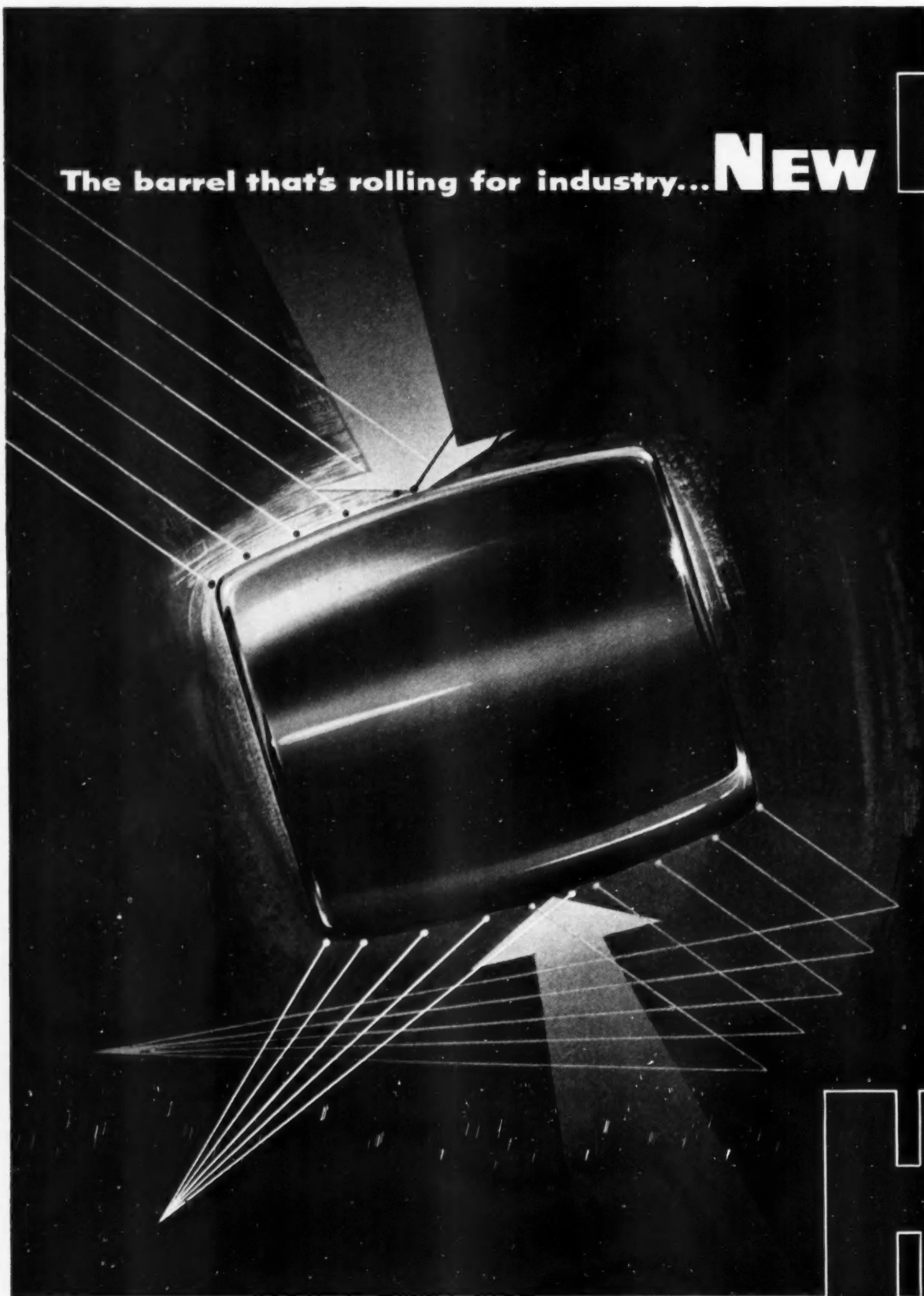
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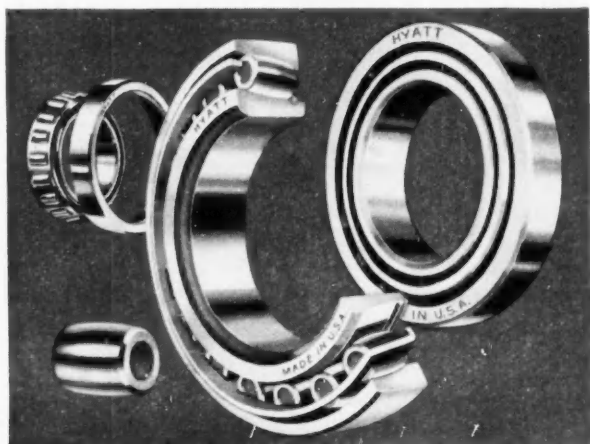
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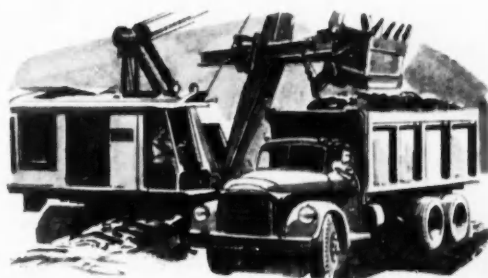
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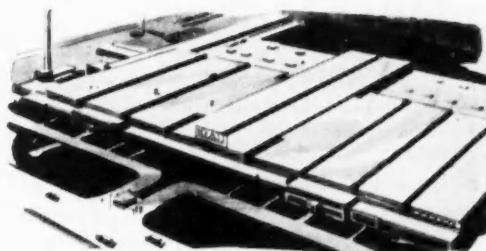
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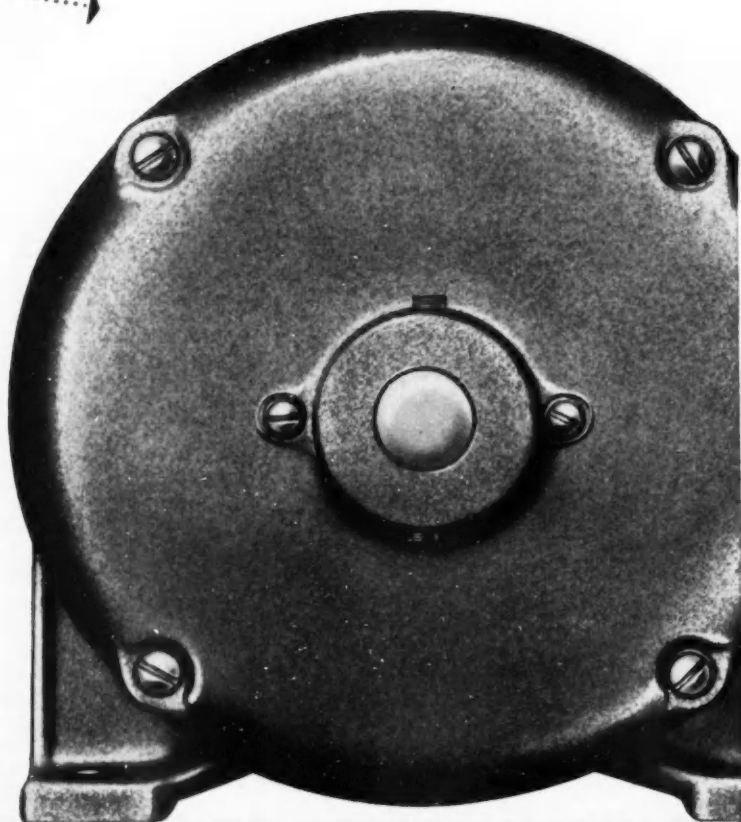
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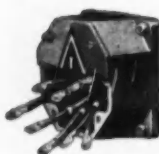
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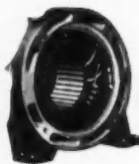
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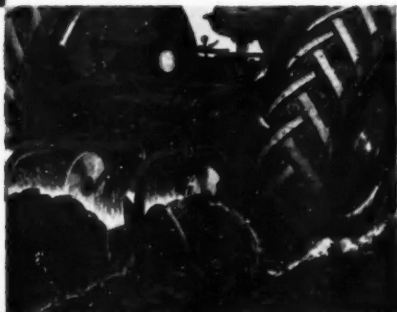
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News of the MACHINERY INDUSTRIES

By Thomas Mac New

Complete Report on
Crush Truing Made
Available. New Mo-
tion Picture Film Em-
phasizes Significance
of Tool and Die In-
dustry.

Crush Truing

A very interesting report issued by Norton Co. answers many questions on crush truing which have been of recent concern to industry. Bruno D. Hendrickson, grinding engineer at Norton, who prepared the material, states that the operating speed during crushing is much slower than the grinding speed, ranging from 100 to 300 sfpm. A two-speed spindle is necessary to drive the grinding wheel at the required different speeds for crushing and grinding, in conjunction with an idler type crusher roll. An alternate to this is the use of a powered crusher roll with the grinding wheel idled.

Speeds

Concerning speeds, he states that following the initial crush-forming of the wheel face only 0.005 in. to 0.010 in. at the most need be removed to re-form and redress the wheel. Feed of the roll is from 0.0001 in. to 0.001 in. per wheel revolution.

Conventional speeds for vitrified bonded wheels, in the range of 5500 to 6500 sfpm, are usual with crush-trued wheels. On some operations such as grinding the finer pitch threads, speeds up to 8600 sfpm are desirable. When particularly sharp forms are ground at higher speeds, the form on the wheel stands up longer between crushings.

Coolant

Straight grinding oils for grinding and crushing have given most satisfactory results, according to Mr. Hendrickson. Less pressure is required and the wear on the crusher roll is reduced using oil during crushing, so that the roll can be used for a greater number of crushings between regrindings. Interference from loose abrasive is particularly troublesome when crushing to grind finer pitches or smaller radii as it tends to cause spalling or chipping of the wheel face. The use of a stiff brush in conjunction with a substantial flushing action of the grinding oil is often resorted to in order to overcome such a condition.

It is recommended when grinding that a liberal flow of coolant under pressure be directed at the point of contact between the wheel and work for satisfactory performance. Insufficient or misdirected coolant is a frequent cause of poor wheel performance.

Work Quality

Mr. Hendrickson explains that there are definite limitations as to the form, depth of groove and finish that can be obtained using the crush-true method of forming the wheel face. In respect to the form, as indicated in Table I under frit size selection, the grinding of a 0.003 in. radius appears to be the minimum possible with a crush-trued wheel. The grinding of threads requiring a narrower root bottom than this, or a form with a sharper radius, should not be attempted. Even Class 4 fit threads which have the closest possible tolerances have been produced commercially with crush-trued wheels.

Straight sides to limited depth can be crushed but roll wear is rapid. The sharp corners of the wheel also break down rapidly, necessitating frequent recrushing. Consequently, the grinding of straight side walls should be avoided if possible. Some work can be tilted in relation to the wheel to overcome this condition.

Tilting of the work is also recommended when the pitch line of the form to be ground is not parallel to the wheel face. This procedure reduces the maximum depth of the groove which in turn lowers the difference in peripheral speed of the crushing roll and the wheel. In crushing a form, only part of the roll can

operate at the same peripheral speed as the mating section of the wheel. The major wear on crushing rolls is due to these differences in speed.

On a straight form the crusher roll turns readily with the wheel. As the form is introduced, there is a speed differential at portions of the form between the roll and the wheel. As the depth of the form increases the difference in peripheral speed increases also. Mr. Hendrickson brings out that this difference between two mating contours is twice the difference in feet per minute between the form and the pitch line of the roll. There is a point on each operation where the slip and wear of the roll are so much that it is not economical to form wheels in this manner. The maximum depth that can be efficiently crush-trued varies somewhat with the width of the form. A $\frac{1}{4}$ in. width form can be readily crush-trued to a $\frac{5}{16}$ in. depth.

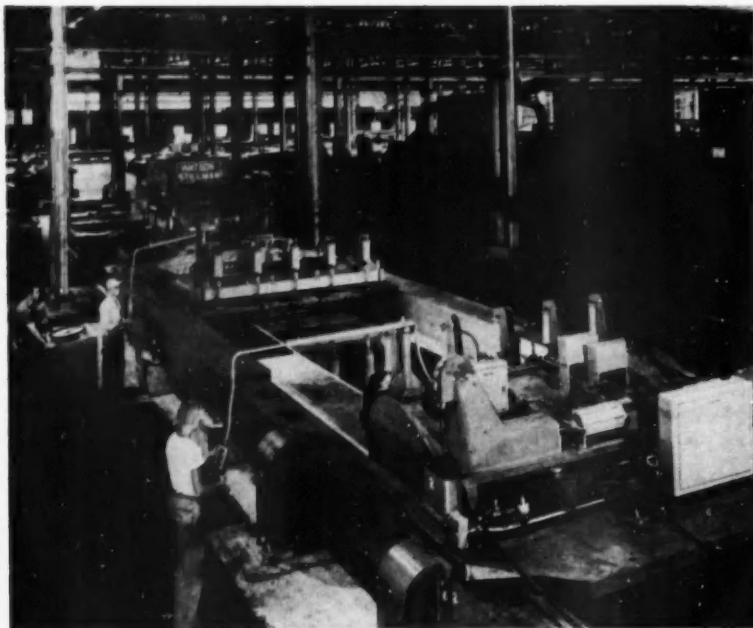
The best finish obtainable with the finest grit crush-trued wheels is generally considered to be about 15 micro-in. There may be some operations where a better finish is being obtained. However, on most applications the finish possible with crush-trued wheels is satisfactory.

More Automaticity

Speaking before the Society for Advancement of Management in New York recently, R. C. Sollenberger, executive vice president, Conveyor Equipment Manufacturers Association, stated that the automatic factory is not practical for many products largely because of the inflexibility of a plant which in effect would

TABLE I

| Maximum Radius (Form Grinding) | Pitch (Thread Grinding) | Coarsest Grit Size Recommended |
|-----------------------------------|----------------------------|--------------------------------------|
| 0.003 to 0.004 in. | 24 to 32 inclusive | 320 |
| 0.005 to 0.007 in. | 16 to 24 inclusive | 220 |
| 0.008 to 0.011 in. | 11 to 14 inclusive | 150 |
| 0.012 to 0.020 in. | 5 to 10 inclusive | 120 |



New 5 million lb stretcher built by Watson-Stillman on the production floor at the Kaiser plant in Trentwood, Wash. It is shown stretching plate of 75S aluminum alloy measuring six ft in width and 1½ in. in thickness. A force of 4 million lb is necessary to stretch this section of 75S.

be a single gigantic production machine. Two conditions which must exist before the economics of automation show profit, according to Mr. Sollenberger, are a stabilized product and a continuing market, with but minor fluctuations in demand. He said that profit margins are so narrow that many highly mechanized automobile plants are thrown into the "red" when any breakdown or shortage of parts or materials makes them lose as little as five per cent of their working time.

Tool and Die Film

Late last month, the National Tool and Die Manufacturers Association gave the premiere of the industry's first motion picture, "Tool and Die Making—Keystone of Mass Production." In addition to emphasizing the significance of the tool and die industry, the NTDMA film describes the apprentice program of the industry and encourages young men with mechanical aptitude to become tool and die craftsmen. The film was very well done and it looks like a must to show around the high schools in order to obtain young craftsmen. People tend to forget that skilled handwork will make the machines for automatic factories possible. We can't think something into being.

Huge Stretcher

Watson Stillman has installed a 5 million lb capacity stretch press, said to be the world's largest, in the Kaiser Aluminum & Chemical Corp. plant in Trentwood, Wash. Purpose of the machine is to flatten high-strength aluminum alloy plate and to relieve residual stresses in the metal which resulted from rolling and heat treatment. The stretcher, which is operated hydraulically, will take plate up to two in. thick and 40 ft long. Overall dimensions of the machine are: length, 81 ft; height, nine ft, two in.; weight, 275 tons; stretching stroke, seven ft.

Miniature Big Press Plant

Alcoa has built a scale model of the new Air Force heavy press plant at Cleveland, Ohio, which it will operate. Built at a cost of \$6500, the model will prove advantageous to construction and production engineers, and enable shop personnel to make constructive suggestions for improvement of the layout.

In addition to the two huge presses—35,000 ton and 50,000 ton—to be housed there, the auxiliary equipment for the presses will be of unprecedented size. In the section of the shop where the press die blocks will be machined, for example, the model will

enable the most efficient placement of equipment for handling and working with large steel blocks.

Training Methods

The National Machine Tool Builders' Association has published a booklet, "Key to Survival and Growth," which summarizes training methods for use in the metalworking industry. Learner training, apprentice training, and graduate engineering programs currently in effect in many machine tool companies are reviewed in the booklet. It lays down specific instructions whereby any company can start an effective training program.

TRACTOR PROBLEMS

(Continued from page 53)

Oil Coolers for Torque Converters

An interesting summary of the development of oil coolers for torque converters was presented by R. P. McDonough, Harrison Radiator Div., He pointed out that in air-to-oil cooling they have used steel construction, although more recently aluminum has been widely employed in aircraft applications. For water-to-oil cooling Harrison has relied upon copper and copper-nickel alloys but has also switched to steel in many cases in the interest of conservation of critical materials.

Advances in Universal Joint Design

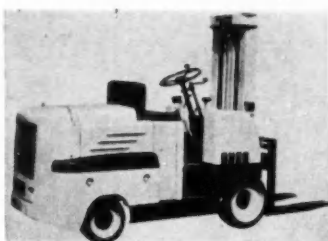
Fred M. Potgieter, Mechanics Universal Joint Div., discussed the problems of universal joint applications to power take-off drives in farm equipment. The major problems an incident to the large increase in the size of tractors, increased engine horsepower, and the use of power take-off shafts driven through an independent clutch. There is a need for industry wide standardization through the cooperation of the FEI, one phase of this work being the possibility of standardization of a slip clutch in the power line. Another requirement is for a universal safety shield for the power line, interchangeable on the tractor and implement.

His company is conducting a considerable research program in the development of universal joints suitable for future requirements. They are placing emphasis on the strain gage method of measuring torque of power take-off drive lines in the design of the product.

EQUIPMENT

PLANT • PRODUCTION

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89



Buda 7500 lb. capacity fork lift truck.

Fork Lift Trucks

Development has been announced concerning two 7500 lb capacity fork lift trucks, models FT75-24 (gasoline powered) and FTD75-25 (Diesel powered).

These trucks are rated at 7500 lb capacity at a 24 in. load center from face of forks and are available in all standard lift heights—72 in., 84 in., 108 in. and 114 in. Model FT75-24 is powered by a heavy-duty Buda 6B-230 gasoline engine and model FTD75-24 has a 6BD-230 Buda Diesel engine.

These trucks have a quick "wide open" type design in which all side panels, rear and top, can be removed for accessibility to all parts. They are provided with a 12 in. diam industrial type quick change clutch which can be changed in approximately 30 min. The trucks feature: a single lever full range gear shift; center point automotive type steering; full front vision instrument panel; hydraulic brakes; all roller rolled-steel mast; and self aligning lift cylinder. The carriage is mounted on quick adjustable side thrust; anti-friction rollers reduce wear and eliminate excessive play in the carriage. Units can be equipped with cushioned or solid rubber tires.

The overall length (less forks) of these trucks is 100½ in., with a wheel base of 60 in. The width of the truck is 42 in. *The Buda Co.*

Circle 66 on page 89 for more data

High Production Machine for Connecting Rods

A two-column automatic machine for drilling, reaming and chamfering automobile engine connecting rods, has just been completed.

The machine processes 565 connecting rods an hour at 100 per cent efficiency and is arranged with tool-steel, laminated, hardened and ground ways. This rapidity of operation is a notable advantage.

A single operator loads the parts manually. Parts are hydraulically

clamped and automatically ejected.

The eight-station holding fixture is mounted on a 60 in. diam index table and heavy-duty ball-bearing construction is provided for all spindles.

Other features include automatic lubrication throughout, special safety precautions and the usual J.I.C. standards for all installations. *Buhr Machine Tool Co.*

Circle 67 on page 89 for more data
(Turn to next page, please)



Buhr machine for connecting rod production.

NEW EQUIPMENT

PLANT • PRODUCTION

For additional information please use postage-free reply card on page 89

(Continued from page 81)

6000 Pieces Per Hour Produced on Double End Machine

A line of double end machines adapted to boring, chamfering, centering, burring, milling, flaring and spinning operations has been designed. These machines are available in a variety of sizes to suit individual requirements.

Extremely high production rates in excess of 6000 pieces per hour are claimed to be the result of a hydraulic powered magazine feed arrangement and unique motorized heads equipped with hydraulic feeds. Spindles in these heads are said to resist unbalanced thrust loads up to 14,000 lb.

Work pieces requiring machining operations on both ends are loaded in the magazine. They are fed one at a time and chucked in a stationary position for machining by the action of a hydraulic cylinder at the rear of the machine controlling fingers and chuck jaws at each end of the work holding fixture. Two air cylinders at each end of the fixture act in conjunction with the hydraulic cylinder to provide uniform tension throughout loading and unloading. The power heads rest on flat ways on the machine bed and are adjusted to a position to suit the length of the part being machined.

When a work piece is positioned between the magazine, the cutter spin-

dles are automatically positioned to compensate for part length variations and are hydraulically fed into depth and retracted. Then the finished part is ejected into a box or basket by the action of the air cylinders as a new part drops in position. Adjustable stops control the travel of the cutter spindles.

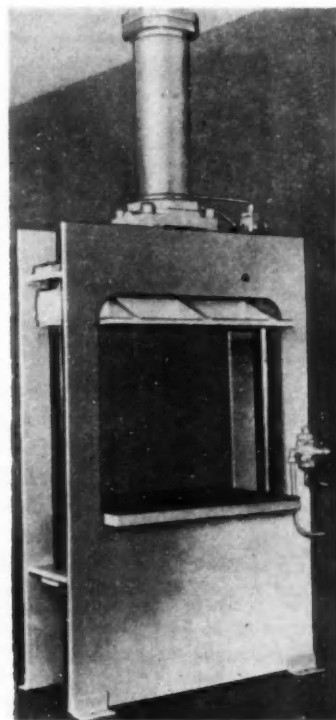
Spindles in the power heads are supported in a 14-in. long sleeve by tapered roller bearings. Hydraulic cylinders at the rear of each head control the feed of the spindles through guide rods attached to the front of the spindle sleeve. The spindle is driven by a splined-hole V-belt pulley and adapter assembly. A sliding spline fit is provided between the spindle end and V-belt pulley adapter.

The machine illustrated chamfers both I.D. and O.D., and faces both ends of 3/16 to 5/8 in. diam metal tubing from three in. to 40 in. long. Length adjustment is automatic for a given size tube. Interchangeable clamp jaws are provided for various tube diameters. An inserted blade combination tool is mounted in each spindle.

The double end machine is 12 ft long, two ft deep and 4½ ft high. Three hp motors power each head. Pushbutton controls on top of the

electrical panel at the front of the machine control the automatic machine cycle. A separate hydraulic power pack unit having a 12-gpm, 1000-psi pump, 10-hp motor, and 40-gal tank provides power for the spindle feed. An air accumulator tank for the work feed mechanism air cylinders is mounted at the front of the machine. The cutter spindle travel is adjustable up to six in. *Walter P. Hill, Inc.*

Circle 68 on page 89 for more data



Sheridan-Gray compression press.

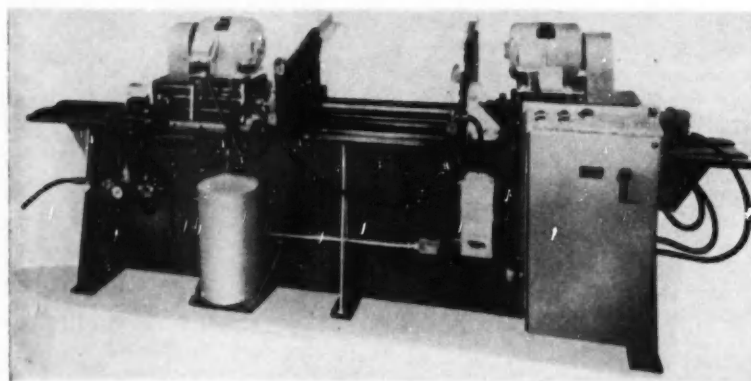
Compression Press

A low cost compression press has been engineered that provides 24 in. by 36 in. platen with a 50 ton capacity and 30 in. stroke.

The low cost frame design is said to give ample strength without sacrifice of accuracy. These presses can be operated singly or in multiple from a central pumping unit. The hydraulic power supply can be located in any convenient spot and need not be mounted on the press. Air hydraulic power units are also available. Controls offered are optional, electrical, manual or automatic being available.

The presses are available in a variety of sizes and tonnages. They are said to offer good manufacturing cost savings. *Sheridan-Gray, Inc.*

Circle 69 on page 89 for more data



Hill high production double end machine.

Non-Flammable Fluids Are "HOT" Items Since Hydra-Matic Fire

Non-Toxic and Non-Corrosive Hydraulic Fluid

A non-flammable hydraulic fluid has been developed which is said to combine maximum fire resistance with top hydraulic efficiency.

This fluid, known as "Houghto-Safe," is said to completely satisfy the need for a safe, non-toxic, non-corrosive liquid that can be used in hydraulic equipment operated near open flames or adjacent to extreme heat conditions.

Houghto-Safe is a water-base, "snuffer type" material which has been rated as an "acceptable hydraulic fluid from the fire hazard standpoint" by the Factory Mutual Engineering Division of Associated Mutual Fire Insurance Companies.

In exhaustive hydraulic pump tests, this new fluid has shown the lubricating ability of high grade petroleum hydraulic oils. It will not freeze and is easily pumpable at working temperatures down to zero F.

It has a high oxidation stability and it will not attack synthetic rubber packings. The viscosity index of the liquid is 150, indicating resistance to viscosity changes at varying temperatures. Physically, Houghto-Safe is amber-colored and extremely oily in nature.

Applications include such equipment as die casting machines, hydraulic foundry equipment, coke oven door closers, hydraulic forging presses, hydraulic glass forming equipment, ingot manipulators, fork lift trucks operating near furnaces or hydraulic

clamping fixtures of welding equipment, etc.

Laboratory and field tests show that Houghto-Safe can be used efficiently at 1000 psi pump pressure. Film strength tests indicate that it will carry 2½ times the load of conventional hydraulic oil of similar viscosity, according to the maker. In addition, the liquid will not separate nor break down under increased pressures. *E. F. Houghton & Co.*

Circle 70 on page 89 for more data

Solvent

Superior machining results with a safety solvent, *TECSOLV* No. 427, when used as a diluent of cutting oils, are reported by the maker. Used in solution with various cutting oils, *TECSOLV* No. 427 is said to be effective in lathe work on fine threading jobs and in a great variety of machine operations where finish is of the highest importance.

Completely non-inflammable and with an evaporation rate approximately the same as that of carbon tetrachloride, the solvent is now available in quantities. *Tect, Inc.*

Circle 71 on page 89 for more data

Coolant

Another fluid, a non-flammable, safety coolant, known as *Dypral*, is said to be a true chemical solution completely soluble in water and free from oil. It is a cold blue, transpar-

ent, general purpose cutting fluid claimed to meet the requirements of most metal cutting operations, including sawing, grinding, and general metal removal. It is said to be equally effective on all commonly used materials, including light metals, copper, plastics, and stainless steels.

While the material is recommended for most types of machine tools, it is not intended for use on automatic screw machines that use the coolant as a machine lubricant as well.

It is claimed that *Dypral* is odorless, does not smoke, foam or become rancid in storage. It is also said to be a rust inhibitor, protecting the work as well as the machine. *Dynamic Industrial Products, Inc.*

Circle 72 on page 89 for more data

Metal Coating

Recently developed is a product known as No. 6100 *Hydrophen* for the surface coating of metals. It is a heat-curing plasticized phenolic resin which is said to offer the possibility of dilution with water or water-miscible organic solvents.

It is claimed that difficulties with wetting and flow characteristics have been successfully overcome with the incorporation of special components. It is possible, using only water as the solvent, to produce baked metal finishes with excellent film properties, gloss, and filling, according to the manufacturer. *Reichold Chemicals, Inc.*

Circle 73 on page 89 for more data

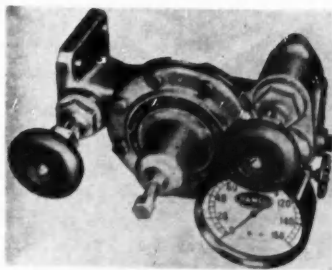
Air Control Manifold Valve for Use on Mechanical Presses

Introduced for use on mechanical presses to control air pressures on such devices as die cushions, counter-balance cylinders, clutches and brakes, and automation auxiliaries, an air control manifold also is said to offer several advantages for many types of pneumatic circuits that require pressure regulation.

Essentially, the unit consists of a globe shut-off valve which admits the compressed air supply, an adjustable pressure regulator, a pressure gage which is protected from line fluctuations by a needle valve, a check valve, and a globe exhaust valve. All these

are housed in one unit which is 10 in. from inlet to outlet.

An important feature of this design



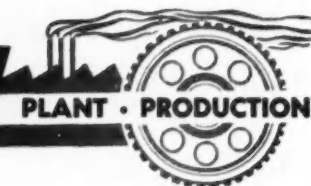
Danly air control manifold valve.

of the air control manifold is the use of special headers when more than one manifold is required. This arrangement is said to further reduce pipe fitting and installation costs and permits assembly in confined space and brings these controls to one centrally located station.

Headers are available in two, four, six and eight station units. The headers are suited for the addition of filters and lubricators. Maintenance costs are reportedly quite low. *Danly Machine Specialties, Inc.*

Circle 74 on page 89 for more data

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NEW**EQUIPMENT****PLANT • PRODUCTION**

For additional information please use postage-free reply card on page 89

(Continued from Page 83)

Heavy-Duty Air Thrust Drilling and Tapping Machines

Now in manufacture is a line of heavy-duty drilling and tapping machines equipped with electrically controlled air-powered thrust. Two models are produced: Model C-16 air thrust drilling machine and Model C-16-T air thrust drilling and tapping machine. Both models are available as box column, floor-stand type, having sliding head and adjustable work table and as bench and table multiple unit combinations having two, three or four head units, either C-16 or C-16-T models.

The Model C-16-T unit is designed primarily for production multiple

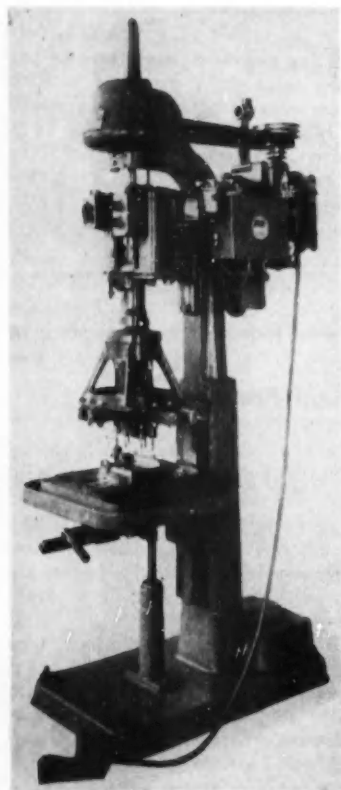
drilling and tapping in a wide range of sizes. It is claimed to put relatively short-run jobs into the high production class because of the ability to drill parts and tap them from the same fixture. This unit performs single and multiple tapping direct from the drill chuck or standard multiple drill head. Control of the air thrust at low pressures provides tapping action which is said to permit the tap to provide its own lead.

Long tap life is obtained without distortion or tearing of the thread. Rotary torque is only force on tap after it enters work. A Class 4 fit can be produced in magnesium, according to the maker.

By switching out the motor reversing controls, drilling operations can be performed and the same fixtures used for drilling can be used for tapping by removing the drill bushings.

Models C-16 and C-16-T are equipped with a dual air cylinder transmission, located vertically on either side of the quill housing. Approach speed, return speed and working thrust are infinitely variable and quickly adjustable. Limit switches and the instant-acting "Hi-Cyclic" balanced air valve provide depth control. A simplified hydraulic dash-pot device controls the drill at breakthrough.

Maximum thrust of 980 lb at 100 psi is obtainable on both models and length of stroke is four in. A six-in. stroke is available. Drilling capacity of the Model C-16 is $\frac{3}{4}$ in. in mild steel. Capacity of the Model C-16-T is $\frac{3}{4}$ in. drilling in mild steel with tapping capacity of one in. N.C. using a one hp motor; $1\frac{1}{2}$ in. N.C. using a $1\frac{1}{2}$ hp motor. The spindle is equipped with a No. 3 Morse taper with No. 2 available, and adaptations for mounting any standard multiple drill head are provided. *The Beckett-Harcum Co., Inc.*



Beckett drilling and tapping machine.

Circle 75 on page 89 for more data

Consumable-Electrode Gas-Shielded Welder

Welding equipment for the consumable-electrode gas-shielded welding process has been announced.

Called Fillerarc, the apparatus is expected to advance the field of application of high-speed, high-current-density, gas-shielded welding.

High-speed metal deposition provided by Fillerarc apparatus enables the operator to more than double output on applications where filler metal must be added, according to the maker. In addition, the equipment simplifies control and reduces costs.

Electrode wire of aluminum, stainless steel, mild steel, copper, magnesium, and other alloys may be employed in the Fillerarc equipment with argon or helium shielding gas. The process can be used in down-hand, vertical, or over-head positions to weld aluminum of any alloy in thicknesses from 1/32 to three in. and stainless steel from 1/16 to one in. It is also suitable for welding aluminum-bronze, nickel, and magnesium.

Fillerarc equipment consists of three main components: a special self-regulating motor-generator type welder, a pistol-like holder, and an electronic wire-drive unit. *General Electric Co.*

Circle 76 on page 89 for more data

Sprocket Chains

An improved line of drive and conveyor sprocket chains has been introduced. Designated as the R, RX, and RR series, they replace and supplement a group in the Rex Chabelco line of steel chains. The R and RX series are drive chains, and the RR, conveyor.

The area of improvement includes controlled material selection and heat treatment for the ultimate in wear resistance and strength; closer planned tolerances of press fits for longer life and smooth operation; better finishes; easier assembly and disassembly. This series of chains will operate on standard sprockets. *Chain Belt Co.*

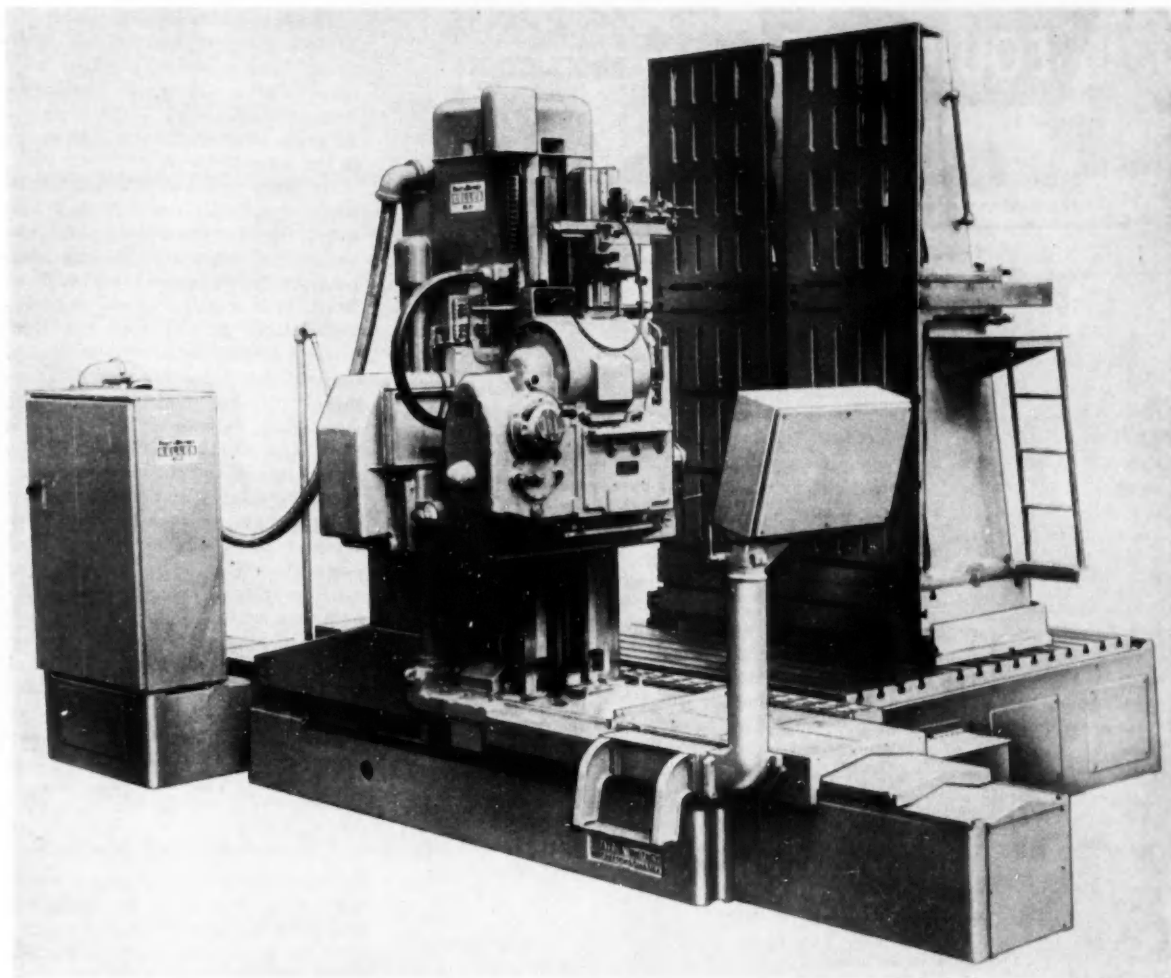
Circle 77 on page 89 for more data

Rust-Proofing Treatment

Recently announced is a chemical treatment for iron and steel items. Called Endurion, the immersion treatment for rust-proofing can be applied in integral colors. *Rust-Proofing and Metal Finishing Corp.*

Circle 78 on page 89 for more data

Medium Size Keller Machine Designed for Electric Tracer Control



Latest Keller machine, the BG-21, being produced by P&W.

Another automatic electric tracer controlled milling machine, the Keller type BG-21, patterned after the Keller BG-22 but smaller in size and capacity, has been developed. The BG-21 has been specifically designed for electric tracer control, but can also be used as a regular milling machine.

"Kellering" with the BG-21 can be done in two ways: (1) Following a sheet metal template or side walls of a model with a profiling tracer and cutting the duplicate shape with the side of an end mill; (2) Using a three dimensional tracer to follow a full model in a series of parallel passes with the spacing preset by the operator, thus duplicating the three dimensional shape. Keller machines are claimed to permit quick conversion from one type of control to the other.

Construction of the BG-21 is hori-

zontal, thus providing the maximum support for the spindle head. Because the workholding table is stationary and the spindle head carries the cutter along the work, the movable weight is always constant. This horizontal construction allows chips to fall away by gravity plus a flood of coolant, and gives the operator a good view of both the model and work being cut. Both the spindle and the tracer are adjustable, according to the manufacturer.

Lubrication is simplified by using a central oiling system. A single pump located at the operator's station provides lubrication to all important surfaces on the machine, giving pressure up to 1000 psi. All sliding surfaces on the BG-21 have phenolic to metal contacts. All lead screws run through molded phenolic nuts. Bedways are protected with roller mounted telescoping guards and wipers.

A speed control automatically regulates the relative component travel speeds over irregular shapes to produce a constant surface cutting speed. All Keller machines are equipped with a power-limiting relay that protects against tool breakage from overloads produced by variable stock removal. The operator sets up the maximum travel speeds, and travel motion of the cutter is automatically slowed to a safe speed during heavy loading and resumes as it clears itself.

Keller BG-21 can be obtained in five different sizes ranging from four ft by 2½ ft up to 10 ft by four ft, plus special two-spindle models. Rapid traverse up to 250 ipm and automatic chip conveyors are standard on the larger models. Pratt & Whitney, Div. Niles-Bement-Pond Co.

Circle 79 on page 89 for more data
(Turn to next page please)

NEW**EQUIPMENT****PLANT · PRODUCTION**

For additional information please use postage-free reply card on page 89

(Continued from Page 85)

Self-Cleaning Dust Collector

Production of the type CH-3 self-cleaning cloth screen dust collector is now underway. This unit permits continuous automatic dust collection, constant air volume and suction, and positive reverse flow filter cleaning, according to the manufacturer.

The CH-3 collector uses the principle of reverse air flow for continuous cleaning of its cloth filters. This is accomplished by action of a traveling manifold whose integral reverse air blowers takes its air directly from the clean air side of the collector.

In operation, the manifold covers three vertical rows of cloth-covered screen frames at one time. The re-

verse flow of air is blown through the center row of screens while normal air flow through the other rows is blocked off. The blocking action is accomplished by the flexible diaphragm on the manifold which is inflated against the grid wall under flow of pressure when the blower unit is centered on a particular row.

This mechanical arrangement causes the dust to be blown from all external surfaces of the filter elements and allows it to drop into the hopper instead of being re-entrained. This arrangement also prevents air short circuiting. The blower motor in the traveling manifold is interlocked

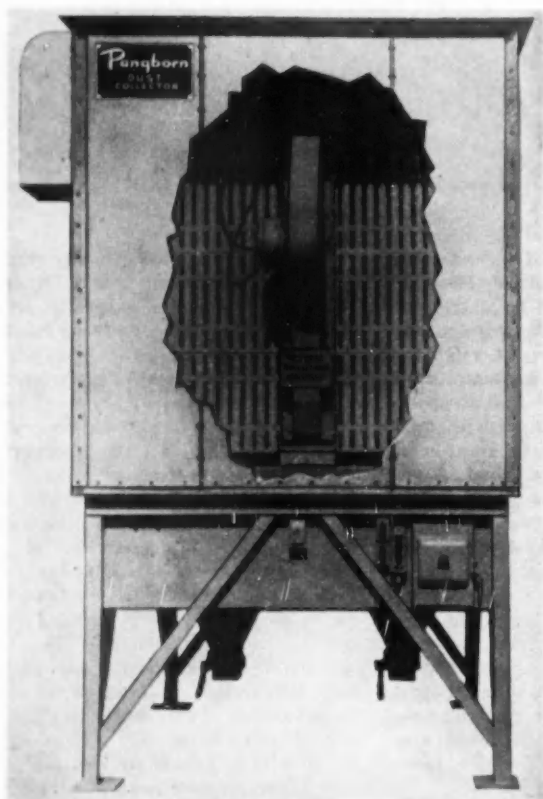
with the main exhaustor motor to insure simultaneous operation.

The manifold travels at slow speeds in both forward and reverse directions. This is accomplished by a reducer and a fractional horsepower motor controlled by a limit switch and magnetic reversing starter, according to the manufacturer.

Standard sizes of the CH-3 self-cleaning collector are furnished with six-screen-high construction. Also available for small air volume problems are four and five-screen-high by five ft long screen sections. Existing installations of the type CH cloth screen collectors can be converted to the self-cleaning arrangement by removal of the mechanical rapping mechanism, replacement of the grid wall, and slight alterations to the screen frames and clamping devices.

Other features of the self-cleaning collector are: all-steel wire mesh screen frames; screens of convenient size and weight for easy handling by one man; cloth filter bag of simple design that can be applied without tension or strain; electrical grounding on screen frames; all moving parts of cleaning mechanism located on clean air side; and accessibility on both dust and clean sides for inspection. Pangborn Corp.

Circle 80 on page 89 for more data



Pangborn self-cleaning dust collector.

Close-Coupled Motors

Close-coupled pump motors are now available as high as 60 hp through a recent development. Designed specifically for use with centrifugal pumps, this motor, type SCB, is said to eliminate shaft alignment or pump mounting problems by supporting the pump on its NEMA style "C" registered mounting bracket. A step shaft, with special diameter, shoulder and tapped hole for mounting the impeller, has all ground diameters for precision assembly and sealing against leakage. Grease lubricated ball bearings permit vertical, horizontal or any intermediate angle installation. Bearings are ample to carry the thrust of centrifugal pumps.

A solid, closed flange on the style "C" adapter bracket prevents entrance of the pumped liquid into the motor. To further effect this protection, a corrosion-resistant, bronze slinger is mounted on the take-off shaft for deflection of any packing leakage.

Additional features include asbestos-protected windings and Lubriflush lubrication of bearings and normalized castings. U. S. Electrical Motors, Inc.

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NEW

PRODUCTS.

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

Aircooled Engine for Wide Range of Applications

Now in production is an aircooled engine known as the K160. It is said to deliver 6.6 hp at 3600 rpm.

The K160 is a single-cyl, four-c unit equipped with oil bath air cleaner, ball bearings, oil-bathed fly-ball governor, fuel filter, rotating grass screen, silencer muffler, and 1 1/4 gal fuel tank. On Model K160P there is a direct-mounting crankcase; on Model K160R, a 6:1 reduction gear; and on Model K160C, a hand clutch.

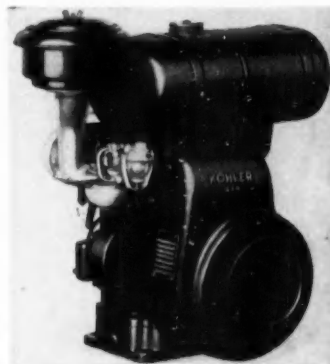
The cooling system has been designed to provide a large volume of

cooling air around the cylinder and head area. Correct temperatures under all conditions are maintained.

Easy servicing is reportedly a leading feature of the K160. The breaker points are readily accessible and the assembly, which is dust-proof and moisture-proof, is mounted externally for quick service.

The engine will provide: 3.7 hp at 1800 rpm; 5.1 hp at 2400 rpm; 6.3 hp at 3000 rpm, and 6.6 hp at 3600 rpm. *Kohler Co.*

Circle 30 on page 89 for more data



Automatic Cooling System Cleaner Uses Chemicals

Now on the market is an automatic cooling system cleaner which comprises a pumping unit with a capacity of 900 gph (five psi at normal unrestricted flow with a maximum possible of nine psi on a completely blocked system).

A fluid-level control valve readily maintains a constant liquid volume flowing in addition to the contents of the cooling system. Direction of flow is controlled by a master valve.

Air pressure is also employed in

combination with liquid chemicals to provide a high frequency agitation for cleaning in cylinder head coolant passages and water jacket as well as the radiator. Pressurized flow returning from the cooling system is broken by a sealed visible chamber. At its base is a filter for removing any particles of foreign matter before the cleaning solution is recirculated through the machine's pumping system. *Apez Chemicals, Ltd.*

Circle 31 on page 89 for more data



Mountable Handtool for Operating Rotary Tools

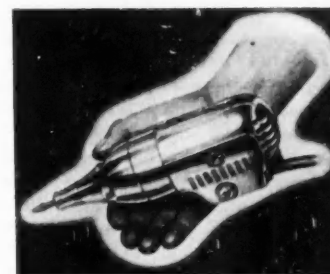
Now on the market is an electric mountable handtool to operate tungsten carbide midget mills as well as all other rotary tools for grinding, milling, finishing, and polishing within a range from 3/32 in. to 3/16 in. in shank diameter.

For precision internal grinding and milling with rotary tools, wheel arbors are available. Arbor sizes in-

clude 1/8 in., 3/16 in., and 1/4 in.

Driven by 1/5 hp universal motor, the one-piece balanced spindle turns at 45,000 rpm and can be reduced in stages to 15,000. Collet chuck is a precision draw-type honed collet. Tool weight is 35 oz, and diameter at chuck nose is said to be only 1/2 in. *Precise Products, Inc.*

Circle 32 on page 89 for more data



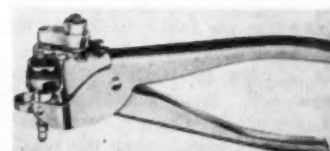
Special Pliers for Setting Spark Plug Electrodes

Recently announced is a special plier which is said to simplify the accurate setting of spark plug electrodes. The gage wheel contains ten sizes: .022, .025, .026, .028, .030,

.032, .035, .036, .038, and .040.

The gage wheel can be easily set to desired size. *Owatonna Tool Co.*

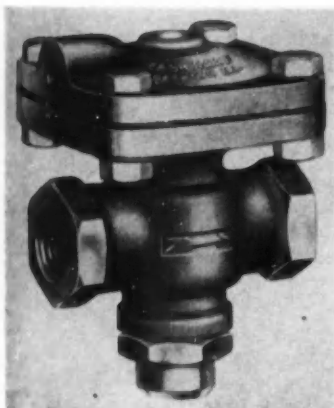
Circle 33 on page 89 for more data
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NEW PRODUCTS.

For additional information, please use postage-free reply card on page 89

(Continued from page 87)



Control Valve

Recently announced is the Type D-53 diaphragm-operated control valve. It is intended for uses wherever it is desirable to control line flow (air, water, various chemicals, and gases) by application of an independent pressure applied to the diaphragm.

The valve is available in either $\frac{1}{2}$ or $\frac{3}{4}$ in. pipe sizes. A. W. Cash Valve Mfg. Corp.

Circle 34 on page 89 for more data

Hydraulic Coupling

Now on the market is a hydraulic coupling that reportedly can be disconnected under full pressure. A manually operated model can be disconnected instantly with a "pull," and connected with a "push-pull." An automatic model can be set to disconnect automatically at any desired load weight, or it can be set to disconnect at a predetermined system pressure, according to the manufacturer.

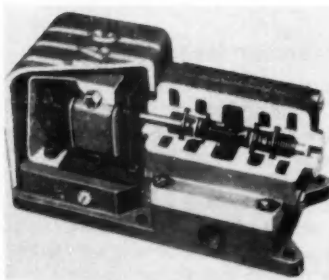
Both models are said to be adaptable in favor of either weight or flow. Known as the Inst-o-matic, the coupling is constructed so that the valves are always open when the unit is connected; they cannot be closed when coupled. Conversely, the valves are always closed when the coupling

is disconnected; valves close automatically when uncoupled.

Socket or nipple reportedly can be used in either direction of flow without difference of operation, or without diminishing the flow. For safety and to minimize leakage when disconnecting, both O rings and flat gasket-type seals are used.

The coupling is furnished with standard type connections: male pipe thread, female pipe thread, hose shank, AND 10050, 10056, 10057, 10058, male flairless type. E. B. Wiggins Oil Tool Co.

Circle 35 on page 89 for more data



Solenoid-Operated Valve

Recently announced is a solenoid-operated air valve with an aluminum-alloy, surface-hardened spool on which the sealing material is integrally molded and bonded.

Downtime is said to be minimized, as the one moving part is serviced simply by removing the retainer. All electrical and mechanical construction is reportedly simple and accessible. Each valve has full pipe orifice area with maximum of straight-through flow. Mechanical Air Controls, Inc.

Circle 36 on page 89 for more data

Oil Additive

Recently marketed is a non-metallic rust inhibiting oil additive for the protection of ferrous surfaces. Indicated uses include the protection of stored aircraft engines (both piston and jet), Diesel and gasoline en-

gines, turbines, pipe lines, and ferrous tools or components in production stages.

Identified as Atpet 100, the inhibitor is a sorbitan mono fatty acid ester that is shipped as a concentrate for addition by the refiner or compounder to his oil. Industrial Chemicals Dept., Atlas Powder Co.

Circle 37 on page 89 for more data

Nickel Plating Process

Recently developed is an organic-type bright-nickel process called Nickel-Lume. Equipment suitable for a Watts nickel bath is said to be all that is required. Ordinary auxiliary equipment may be used, filtration may be either periodic or continuous, ventilation is not required, and heat demands are low.

Deposits with the process reportedly have: a bright white color; well-leveled surfaces; low internal stress; good ductility; and highly active surfaces.

Baths reportedly may be operated from room temperatures up to or beyond 140 F with full deposit brightness. With moderate to high current densities, a temperature beyond 120 F is seldom required.

Current densities may be varied from 5 asf to above 70 asf. It is claimed that uniformly bright deposits may be plated on intricately shaped articles, and plating speed may be changed to meet various specifications and production schedules. Hanson-Van Winkle-Munning Co.

Circle 38 on page 89 for more data



Truck Tire Demounter

Recently introduced is a hydraulically operated truck tire demounter. The unit is used for removing stuck or frozen tires from all types of trucks by hydraulic pressure.

The demounter reportedly will handle all size truck tires 15 in. to 24 in. The Bos Tool Co.

Circle 39 on page 89 for more data

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FREE LITERATURE

Deburring Units

Bulletin No. 103-57 describes two Maizo Blast machines for deburring a variety of "soft" metal parts. *Modern Industrial Engineering Co.*

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Hydraulic Fluid

Now available is a bulletin describing a non-flammable hydraulic fluid known as Houghto-Safe. It is non-corrosive and non-toxic as well, while maintaining complete operating efficiency. The fluid is particularly recommended for plants where hydraulic operations present a fire hazard. *E. F. Houghton & Co.*

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Aluminum Fabrication

Ready for distribution is a catalog describing the broad facilities of an aluminum fabricating service. *Reynolds Metals Co.*

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Steel Coating

Recently published is a 12-page booklet entitled "How to Apply Better Zinc Phosphate Coatings to Steel in Preparation for Painting." The new CryCoat HC process is featured. Copies should be requested on firm letterheads. *Oakite Products, Inc., 128H Rector St., New York 6, N. Y.*

Plating Anodes

Bulletin No. 141 provides data on copper, lead, zinc, tin, tin-lead, cadmium, cadmium oxide, and brass plating anodes. *Federated Metals Div., American Smelting and Refining Co.*

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Tap Selector

Just announced is a pocket-size slide chart for selecting and specifying the correct drill and lubricant as well as the proper tap for a particular job. *Threadwell Tap & Die Co.*

Circle 5 on postcard for free copy

Welder Controls

Bulletin No. 10-213 describes a series of non-synchronous coordinated controls for resistance welders. *The Taylor-Winfield Corp.*

Circle 6 on postcard for free copy

Roller Chain Sprockets

Catalog B55-53 lists prices and specifications for Taper-Lock stock roller chain sprockets. *Morse Chain Co.*

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Industrial Furnaces

Bulletin D covers a line of industrial furnaces for various applications. *Eclipse Fuel Engineering Co.*

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PRODUCTS

PAGE

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Nickel Steel Welding

Bulletin A-93 studies various welding techniques for nickel alloy steels. Included are some of the newer inert gas processes, electrodes, preheat treatments and post heat treatments. *The International Nickel Co., Inc.*

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Screw Machine Products

Recently released is a brochure on the production and processing of precision screw machine products, parts, and assemblies. *Z & W Machine Products, Inc.*

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Jig, Fixture Components

Recently published is a 66-page manual on over 500 jig and fixture components. *Standard Parts Co.*

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Magnesium Plate, Sheet

Recently published is a booklet on magnesium plate and sheet. *Brooks & Perkins, Inc.*

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Aircraft Electric Motors

Bulletin No. 1535 describes 22 models of aircraft electric motors. The range is 1/20 to 16 hp. *U. S. Electrical Motors, Inc.*

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Power Systems

Now available is a brochure on 15 applications of hydraulic and pneumatic power systems. *The Rucker Co.*

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Steel Tubing

Recently published is a brochure on the use, fabrication, and physical properties of small diameter steel tubing. Data on mechanical properties, diameters, tolerances, wall thicknesses, and pressure tests are provided for all GM single and double-wall steel tubing. *Rochester Products Div., General Motors Corp.*

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Bearings, Bushings

Fresh off the press is a 104-page catalog with specifications on a line of bearings, bushings, bar bronze, babbit metal, etc. *Johnson Bronze Co.*

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Aluminum Alloy

Ready for distribution is a booklet on Lurium, a light, high-purity aluminum alloy with a lustrous high finish. *Fromson Orban Co.*

Circle 17 on postcard for free copy

Shaving Machine

Recently released is Bulletin (No. S-53-7) describing Model GCU Red Ring shaving machine. *National Broach & Machine Co.*

Circle 18 on postcard for free copy

Transmission

Bulletin No. 5328 describes the TSD-2 and TSD-4 Torq-Master transmission for engines rating up to 550 hp. *Western Gear Works, Inc.*

Circle 19 on postcard for free copy

Fluid Line Tubing

Now available is a circular on hydraulic fluid line tubing that meets J.I.C. standards. *Tubular Products Div., Joseph T. Ryerson & Son, Inc.*

Circle 20 on postcard for free copy

Metal Parts Cleaning

Fresh off the press is a special technical folder on the Soniclean process, the application of ultrasonic energy for the cleaning of metal parts. Principles and methods used are covered in detail. *Detrex Corp.*

Circle 21 on postcard for free copy

Production Resumption

Vol. 44, No. 6 of "Grits and Grinds" features a story on how production was resumed in record time at the manufacturer's grinding machine plant after a disastrous tornado struck. *Norton Co.*

Circle 22 on postcard for free copy

Generating Plants

Recently issued is a booklet of general data on the selection of engine-driven electric generating plants. *D. W. Onan & Sons, Inc.*

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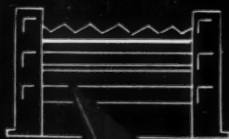
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ALLOY TOOL • SPECIALTY • NITRALLOY • CARBON
TOOL • AIRCRAFT QUALITY**

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Straightened • Cold Drawn • Machine Turned • Centerless Ground**

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NEW



AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

Flight Recorder

Recently announced is a flight recorder designed to record altitude, air speed, vertical acceleration, time, and heading.

Among the features claimed for the unit are: 300-hr running time; resistance to 2000 F temperature for one half hour without destruction of the record; direct recording (no photographic process, magnetic playback or other process required to see the record); 10-min running time in event of aircraft power failure; no electronic circuitry and, therefore, repeatable results and increased reliability.



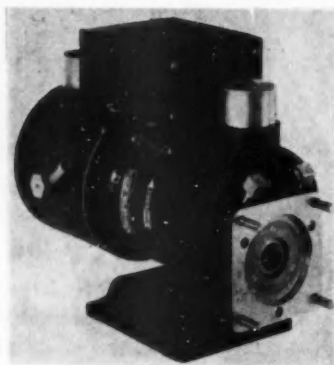
General Mills flight recorder.

The unit weighs 16 lb with fireproof case and 12 lb with non-fireproof case. Mechanical Div., General Mills, Inc.

Circle 26 on page 89 for more data

Hydraulic Pump Motor

Now in production is an air-cooled 3½ hp hydraulic pump motor for use in jet bombers. Rated at 7500 rpm, the motor is said to supply hydraulic power for control of the aircraft's tail assembly, and in the wing serves as a standby source of power where the jet engine is the primary source. It may be mounted either horizontally or vertically.



GE hydraulic pump motor.

Of the ducted type, the motor employs an air-through design which utilizes a built-in blower to draw ambient air from outside the plane, circulate it through the brushes and windings, and expel it from the pulley-end stack.

The motor reportedly can circulate air from -65 to 135 F at altitudes approaching 50,000 ft. Said to be explosion-resistant through the use of two blower tubes connecting via ducts to the outside air, the motor has a three-to-one gear reduction and is equipped with a radio noise filter. Condensate tubes on its side draw moisture out of the motor. General Electric Co.

Circle 27 on page 89 for more data

Cushioned Clamps

Now in production is a line of stainless steel, cushioned clamps which are said to be flame-proof, fire-proof, and able to resist temperatures as high as 1200 F. They are recommended for jet engine installations and for areas where flames and sparks are found.

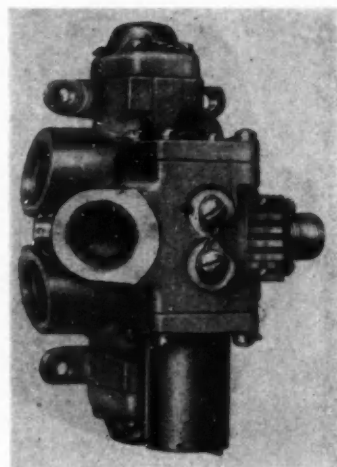
Designated the TA1716 and TA1774 Series, the clamps are available in sizes from ¼ in. to six in. diam in increments of 1/16ths in single and multiple tube clamps, according to the maker. Thomas Associates.

Circle 28 on page 89 for more data

Jet Engine Valve

Recently announced is a valve, designated as Part No. 28161, that is said to be especially designed for jet engine nozzle eyelid control systems.

Operational sequence is as follows: spring-offset, two-position, solenoid-operated, four-way valve uses engine oil to operate hydraulic cylinders; solenoid energized, 3000 psi at inlet port produces outflow at cylinder port No. 1, cylinder No. 2 open to return; solenoid de-energized, produces outflow at cylinder port No. 2, cylinder No. 1 open to return.



Adel jet engine valve.

The unit is reported to have these features: ambient temperature range -65 to 350 F; operating pressure 3000 psi; ports available in ¼, 5/16, ¾ and 1½ in. tube sizes; operating voltage 18-30 v dc; one amp current at 30 v; operating fluid MIL-L-7808; and non-interflow type valve.

This valve has no packing on sliding members, and the solenoid is a continuous-duty type. The pilot valve is spring-loaded against pressure to 4000 psi min. Adel Div., General Metals Corp.

Circle 29 on page 89 for more data



**"That was 12 hours' work . . .
NOW WE DO IT IN 8!"**

Yes, the operators who've struggled along with older turret lathes will tell you: A 50% increase in production is not unusual when you replace with new Gisholt Ram Type machines.

Many of the old manually operated functions have now become automatic. They're so much simpler and easier to run that you can't help but get more efficiency. Selective automatic speed changing gives instant changes between high and low spindle speeds. There's hydraulic clutching and braking—no effort.

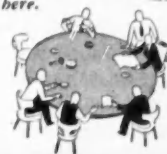
Automatic indexing and clamping of the hexagon turret saves more time. These are a few of the modern features that give you the smooth production rhythm that insures higher overall efficiency.

Add to these the power and rigidity to take multiple cuts and you have the unbeatable combination that means bigger production and lower costs. It's the performance that will "buy off" your older machines. Replace with modern Gisholt Turret Lathes.

GISHOLT
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Madison 10, Wisconsin

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.



TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

METALS

*Good Demand for Lead with Price Apparently Stabilized.
No Improvement in Zinc Situation. Brass Prices Reduced.*

By William F. Boericke

Steel Now a Buyers' Market

For the first time since the end of the steel strike the industry's rate of output dropped below 90 per cent of capacity. Up to the middle of September this made the eighth successive week that the industry failed to reach its scheduled output. While most steel mills are booked up for October only a few have capacity orders for the rest of the year and generally steel salesmen are out looking for November and December business. Definitely the steel industry has entered into a buyers' market.

Cancellations thus far have been on the light side but it is feared they may increase with cutbacks in the defense program, layoffs for the farm equipment manufacturers, and shortened work schedules for the independent automobile manufacturers. The market for iron and steel scrap, long considered a barometer for the steel industry, continues to crack. *The Iron Age* No. 1 heavy melting scrap composite dropped to \$38.65 in mid-September. Many scrap traders believe a lower price level for scrap will ensue.

Not the least indication that halcyon days are over for the steel industry is consumer pressure on the mills for the latter to absorb freight charges which have heretofore been paid by the buyers. This insistence will increase as selling becomes more competitive and may force the mills to pay the freight or lose some of their distant markets to nearer sources of supply.

Alloy steel manufacturers have been affected severely by the slower tempo in Detroit and stainless steel producers have had to accept freight absorption to a large extent. Some producers were down to 75 per cent capacity, with little forward buying.

Copper Trade Is Jittery

Confronted with uncertainty over Government action on disposal of Chile's huge stock of 100,000 tons of unsold copper, consumers bought copper cautiously and refused to make future commitments at 29-30 cents per lb. There was widespread belief that the copper price would start skidding and surprise that it should remain relatively firm in the face of weakness in other metal markets.

Every week of delay in settling the troublesome matter of Chilean copper makes the market more vulnerable. While Chile's production has been cut back 30 per cent it still totals about 30,000 tons per month.

This is more than one-third the output of all U. S. copper mines, and at present is being withheld from sale. Decision to offer this metal at going prices would almost certainly cause a readjustment in the market. Decision to throw all the government-held stocks of 100,000 tons on a free market would unquestionably bring an extremely painful price decline.

It is hardly possible that Washington would consider anything that would have so grave a repercussion on the metal market. In all likelihood the copper will be put out of circulation by semi-permanent retirement in the strategic stockpile. This would remove a major uncertainty but would still permit a large addition to imports which have recently been as high as 70,500 tons or only 10,000 tons per month less than our total mine production.

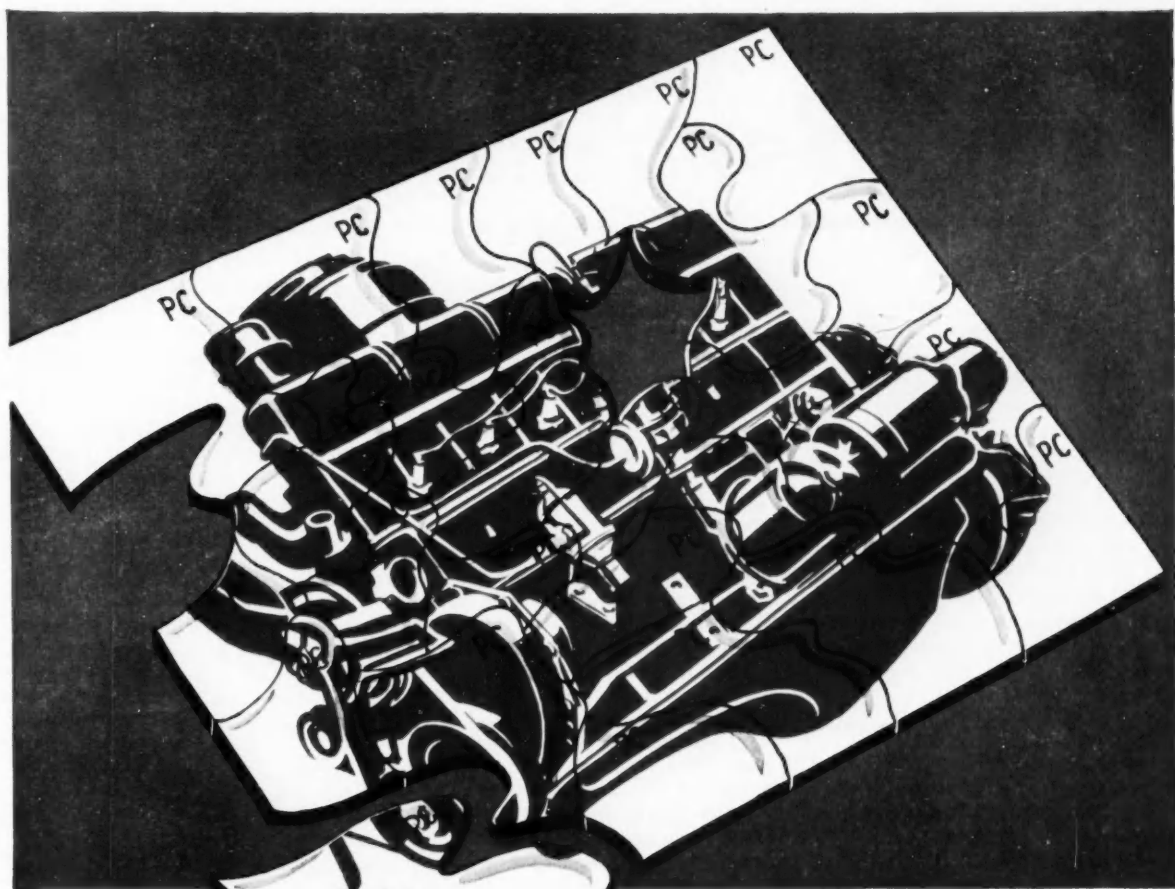
When copper trading opened in the London Metal Exchange in August the world price slumped, then recovered surprisingly well in the face of weakness in other metals and in commodity prices generally. The price of No. 1 scrap in this country, which broke to 21 cents per lb in August, recovered to 23 cents in September. Fabricators' shipments in July declined heavily from the six-month average, and their stocks of metal increased 43,000 tons since the first of the year. Summer vacations were blamed for the lull in business. Producers' inventories of metal continue to remain at a minimum figure. It is obvious that fabricators and warehouses are carrying the whole load of excess inventories, if they exist. Developments before the year-end will show whether the invisible inventories with consumers have been excessive. Unfortunately there are no figures available for the trade.

Nickel Decontrol Is Postponed

It was strongly indicated at Washington last August that nickel would be speedily decontrolled for industrial users as the supply was improving. It now appears that decontrol won't come before early October, and probably later. Makers of stainless steel have been urging an end of existing curbs for months. The Korean truce had given renewed hope that military demands for nickel would be less insistent but OPS wants further data to show what effect decontrol would have on the defence program.

However, there is little doubt that nickel is not in as scarce supply as it was six months ago. In the "grey market" the metal used to sell for as much as \$3-4 per lb. These prices have vanished, although a substantial premium is still paid over the established price of 60 cents per lb.

(Turn to page 112, please)



This is the picture!

25 out of 27 leading engine manufacturers
using chrome rings

specify **Perfect Circle**

The standard of comparison

The application of solid chrome plating to piston rings, as pioneered and perfected by Perfect Circle, more than doubles the life of pistons, rings and cylinders. Performance data will be furnished on request. Write Perfect Circle Corporation, Hagerstown 3, Indiana.

Observations

By Joseph Geschelin

Bright Future

In a *Detroit Free Press* interview early in September, Harlow H. Curtice, president, General Motors Corp., said that, in his opinion, the future of the automobile industry is very bright despite recent conclusions of some economists that the market will be limited to almost half of the industry's potential capacity. "I fail to understand why so many efforts are made to write down the future of the industry since, after all, we fix our production schedules according to our own conclusions, not estimates of outsiders."

In the past the predictions of general economists have missed fire badly. Perhaps economists not familiar with the industry at first hand do not realize that motor car manufacturers have their own economists and market analysts who specialize in this extremely specialized field. When leaders in the industry make a forecast for the coming year, as they will be doing this fall, their estimates will not be based upon educated guesses or an eye to the stock market. Such estimates are based upon intelligent market analysis as well as reports directly from the firing line. There is too much at stake in this business to print speculative production schedules.

Automotive leaders definitely cannot see a dismal picture. In fact, as Curtice said they foresee very good business indeed.

Out of the welter of economic pronouncements one fact emerges: that the motor car business is so vast and so dynamic that it continues to build better and bigger years through its own unique resources. Manufacturing schedules are built on facts, on orders, and not on guesses or estimates. Usually, schedules are established three to four months in advance and made firm about two weeks ahead of production. When they are firmed up they represent actual orders for individual customers.

Perhaps the best evidence of what the industry thinks about the future is the continuing wave of decentralization and new plant building programs. GM, Ford, Chrysler, and

others have been putting millions of dollars on the line for entirely new plants and new tooling programs. Big business does not indulge in such programs unless they are justified and will pay off.

The fact of the matter is that automotive manufacturers right now are the major customers and the main prop of the machine tool industry. The industry too is a major consumer of most basic materials—steel, copper, glass, upholstery, rubber, paints and lacquers, and light metals. It wields a dynamic influence upon the basic economy no matter how you look at it.

Many factors contribute to this phenomenon. The automobile remains the most valued possession of an American. Automobiles ceased to be pleasure cars a long time ago. Not only did it help to make America great but it is the chief instrument in the escape of city dwellers to the suburbs. Millions of workers commute to places of business from localities 25 to 35 miles away. There would not be the employment nor could there be decentralized plants were it not for the automobile—in many instances, the only mode of transportation. We still wonder why these economic studies are made and how one determines a revolutionary change in buying habits.

Disaster Aftermath

The recent Livonia fire has loosed a chain of speculation regarding fire protection and modern plant construction. In discussing this matter with one of the leading architects in the industrial field, we learned that in some instances fire protection has been shaded by reducing the area covered by sprinkler systems to a bare minimum in the interest of first cost. It would not be at all surprising to find a greater acceptance of wider area sprinkler protection from now on.

Good housekeeping is another important factor. Ways must be found to reduce the amount of drag-out of volatile or flammable fluids resulting from metal cleaning and painting operations as well as periodic cleaning of accumulations. It is claimed that in large machine shops the accumula-

tion of volatile fumes from metal cutting fluids also constitutes a hazard. In some of the new plants there is provision for an enormous volume of fresh air circulation with the installation of large capacity ventilating and exhaust systems. In certain areas where the problem justifies the outlay, electrostatic precipitation of dust and fumes is practiced.

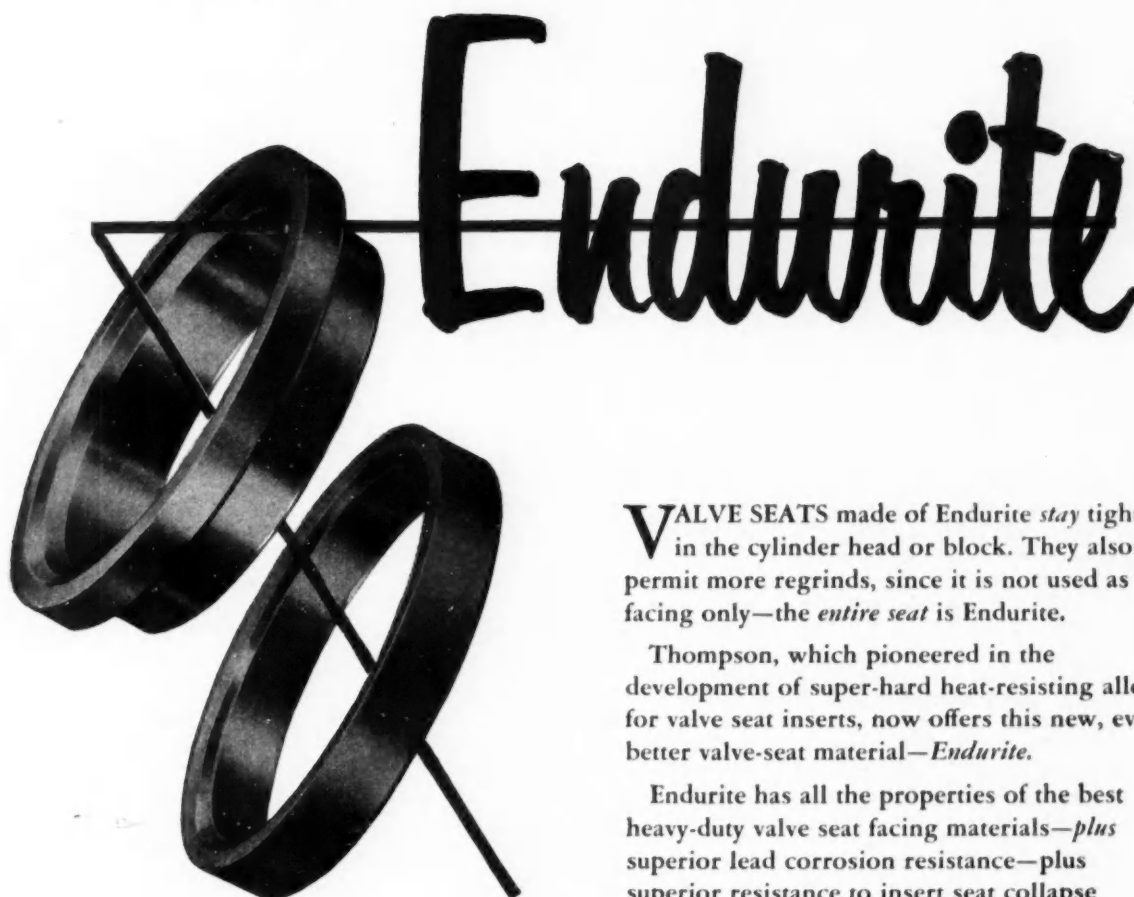
There has been considerable talk about fire walls. At Livonia, fire walls saved the office buildings and official garage from damage. But modern plants designed for mass production require big open spaces for conveyors and the flow of parts and assembly operations. No plant built within the past ten years or so could be fitted with fire walls without hampering efficiency. True, certain areas have been isolated but it is difficult to conceive of a modern plant with restrictive partitioning. This is a neat problem for the specialists.

What is more pertinent is the need for an adequate and independent source of water supply for each isolated plant. And the need for special protection around hazardous areas, perhaps by judicious use of a system such as Cardox in the immediate vicinity of many pieces of equipment using flammable materials.

Power Steering

Acceptance of power steering on passenger cars has been so dramatic that it may put the squeeze on truck and bus equipment to adopt a device so attractive to the public and so helpful to the driver. From the standpoint of fatigue reduction and safety it holds many advantages. One school bus producer told us recently that he is experimenting with power steering, his leaning being to an air-operated type since the vehicle is equipped with air. With him it is not a matter of driver effort as much as a desire to get faster response to the wheel. Right now they use a very high overall ratio to reduce steering effort but that results in extremely long wind-up, too many turns to the wheel.

VALVE SEATS STAY TIGHT WHEN YOU SPECIFY



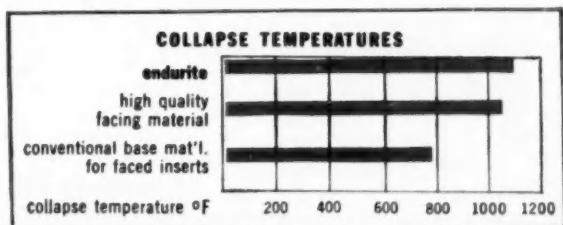
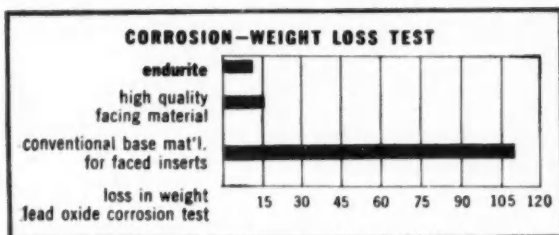
VALVE SEATS made of Endurite *stay* tight in the cylinder head or block. They also permit more regrinds, since it is not used as a facing only—the *entire seat* is Endurite.

Thompson, which pioneered in the development of super-hard heat-resisting alloys for valve seat inserts, now offers this new, even better valve-seat material—*Endurite*.

Endurite has all the properties of the best heavy-duty valve seat facing materials—*plus* superior lead corrosion resistance—*plus* superior resistance to insert seat collapse or loosening.

Our engineers will discuss valve seat inserts for your gasoline, Diesel or propane engine, if you write or phone Special Products Division, Thompson Products, Inc., 2196 Clarkwood Road, Cleveland 3, Ohio.

These charts indicate Endurite superiority over other types of materials used in valve seat insert manufacture.



**You can count on
Thompson
Products**

SPECIAL PRODUCTS DIVISION

News of the Industry

(Continued from page 39)

Process Bonds Vinyl to Metals

A method of laminating vinyl plastic and sheet steel or aluminum which is said to make these metals decorative and permanently rust and corrosion proof has been developed by the Naugatuck Chemical Div., U. S. Rubber Co. More than 20 manufacturers of containers, business machines, chemicals, metals and allied products are now experimenting with the process.

The process consists of bonding Marvinol, Naugatuck chemical's vinyl, to sheet steel or aluminum. The resulting laminate, called Marvinol-Metal Laminate, has a higher abrasion resistance than varnish, paint and baked enamel finishes. It is said that 180-deg bends and deep draws can be made without separating the vinyl from the metal. Cost of the laminate is higher than galvanized iron, but only about one-third the cost of comparable gauge stainless steel.

The laminate is made by low-pressure rolling rigid or semi-rigid Marvinol vinyl sheet onto heated adhesive-coated metal sheets or strips. After rolling, adhesion is effected in seconds under a suitable heat source. It is a process which can easily be adapted to high speed production for fabricating either continuous rolls or individual panels.

To date cold-rolled steel, hot-rolled pickled steel and aluminum, from 18 to 34 gauge, have been used to make the laminate. The vinyl films used have ranged from .002 to .02 in. thick. Tests on the finished laminate indicate an adhesion in excess of 40 lb per square in. of width, which permits the laminate to be fabricated with all types of regular metal-forming equipment without damage to the coating.

The laminate can be sheared, drilled or punched without chipping. Crimp rolls, 90-deg crimp bends, 180-deg bends and deep draws can all be made without damaging the coating.

New Service Trench

Fairchild Aircraft Div. has developed and installed a new type of service channel system in a hangar floor. Service channels for both high and low potential electric service lines and air hoses are formed of hat-type sections of 10 gauge steel bedded in the concrete flooring. They are one in. wide at floor level, but are three in. wide at the bottom, with a depth of 2½ in. A major advantage of the system is that it overcomes the problem of gases collecting in deep floor trenches, with attendant explosion and fire hazards. Regular disconnects may be used with the Fairchild system, instead of the vapor-proof disconnects required for conventional trench wiring.



Defense Dept. and ODM strongly favor periodic inspection and evaluation of "packages" of machine tools, held in readiness for use at emergency times, to insure that the components actually will meet changing production needs.

Complete scrapping of federal excise taxes on automotive items is not in the cards for next year, according to talk on Capitol Hill. But there's no reason to believe that automatic cuts won't go through on schedule as of April 1. Gas and diesel fuel taxes are to drop from two cents a gallon to 1½; truck, bus, trailer, and parts and accessories to revert from eight per cent to five.

Office of Defense Mobilization will not have a decision on the third round of aluminum production expansion before about Oct. 15.

Final days of the federal fast tax write-off program are not yet here, even though the Government is planning to thin the flow of certificates of necessity to defense plant expansion projects.

Reaffirmation of the legality of individual delivered prices is expected from the new Republican majority on the FTC. Congressional committees are expected to lose no time next January in pressing for enactment of bills authorizing the quotation of delivered prices by producers of steel, chemicals, cement, and other heavy industrial products subject to hefty shipping devices. The FTC is expected to tell Congress that it considers freight absorption entirely legal—so long as it is practiced on an individual company basis and not in collusion among a group of companies within any industry.

1953 NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1953 Seven Months' Totals

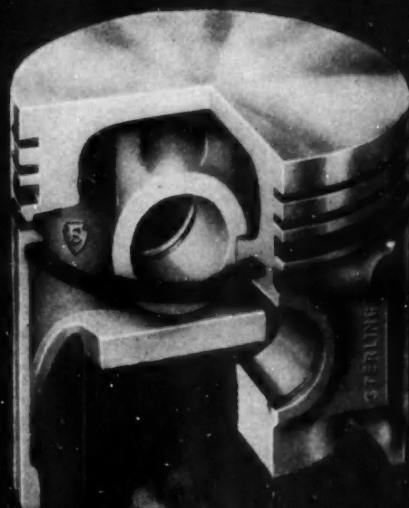
| MAKE | SEVEN MONTHS | | | | | |
|--------------------|--------------|-------------------|-----------|-------------------|-----------|-------------------|
| | July 1953 | | June 1953 | | July 1952 | |
| | Units | Per Cent of Total | Units | Per Cent of Total | Units | Per Cent of Total |
| Chevrolet | 129,040 | 23.39 | 137,390 | 20.52 | 62,090 | 20.52 |
| Ford | 99,178 | 16.84 | 72,500 | 16.21 | 47,104 | 16.21 |
| Plymouth | 84,864 | 10.46 | 68,406 | 11.16 | 41,361 | 11.16 |
| Buick | 43,194 | 8.20 | 47,826 | 7.51 | 24,863 | 7.51 |
| Pontiac | 39,382 | 7.11 | 42,360 | 6.29 | 21,270 | 6.29 |
| Oldsmobile | 32,923 | 5.26 | 35,082 | 5.26 | 17,307 | 5.26 |
| Dodge | 26,856 | 5.48 | 31,651 | 6.31 | 25,569 | 6.31 |
| Mercury | 22,270 | 4.15 | 17,768 | 4.19 | 14,311 | 4.19 |
| Nash | 12,178 | 2.89 | 14,031 | 3.50 | 14,492 | 3.50 |
| Studebaker | 13,450 | 2.86 | 17,079 | 4.10 | 11,934 | 4.10 |
| Chrysler | 14,321 | 2.81 | 18,307 | 2.92 | 10,845 | 2.92 |
| De Soto | 11,188 | 2.16 | 11,717 | 2.25 | 8,197 | 2.25 |
| Cadillac | 9,782 | 1.94 | 10,324 | 2.01 | 7,944 | 2.01 |
| Packard | 6,470 | 1.49 | 7,710 | 1.72 | 7,234 | 1.72 |
| Hudson | 6,238 | 1.31 | 7,348 | 1.95 | 7,908 | 1.95 |
| Willlys | 3,140 | .89 | 3,942 | .40 | 4,653 | .40 |
| Lincoln | 4,438 | .76 | 5,010 | .61 | 2,737 | .61 |
| Kaiser | 2,067 | .51 | 2,657 | .96 | 3,994 | .96 |
| Henry J. | 1,173 | .24 | 1,142 | .81 | 2,675 | .81 |
| MG (British) | 837 | .14 | 752 | .17 | 668 | .17 |
| Hillmann (British) | 338 | .08 | 662 | .10 | 463 | .10 |
| Ford (British) | 296 | .06 | 334 | .06 | 337 | .06 |
| Jaguar (British) | 379 | .07 | 381 | .07 | 264 | .07 |
| Austin (British) | 232 | .06 | 294 | .12 | 431 | .12 |
| Alfa Romeo | 123 | .02 | 100 | .04 | 175 | .04 |
| Misc. Domestic | 87 | .04 | 221 | .12 | 331 | .12 |
| Misc. Foreign | 616 | .12 | 680 | .10 | 461 | .10 |
| Total—All Makes | 533,763 | 100.00 | 642,193 | 100.00 | 340,454 | 100.00 |

* Based on data from R. L. Polk & Co.



Than Nuclear Fission !

METERED STEEL REACTOR



Now Allows You To Specify
Your Own Piston Clearance!

with **STERLING**
CONFORMATIC*
PISTONS

Tests now prove that by varying the strength and design of the steel insert we can pre-determine piston skirt expansion and contraction to meet your exact engine specifications...



INTERNATIONAL NEWS PHOTO

CONSTANT CLEARANCE over the entire temperature range from -20° F. to 200° F. Closer clearances than ever before possible without danger of scuffing or seizing.

*Trademark Reg., Patent Applied For

STERLING ALUMINUM PRODUCTS Inc. SAINT LOUIS, MISSOURI

Powerglide Governor Gears

(Continued from page 69)

cam-operated differential up-feed feature provides a variable rate of feed of the cutter, starting with a very fine feed and increasing the depth of feed with each successive pass of the cutter. Instead of completing the shaving cut in one pass, as is customary, the machine makes a number of shorter passes, increasing the depth of cut progressively.

It is noteworthy that in shaving the hardened gear with multiple passes, the cycle is faster than with a single pass since the strokes are shorter and are effected at higher rates of speed. Cutter life has been improved materially while final finish and gear quality are better than before.

It may be noted too that hobbing

of this gear made it necessary to effect some major changes in attachments on the Cleveland hobber as well. The gear on the output shaft is cut with a four-in. diameter hob and it became necessary to develop some means for feeding the cutter into depth and out of engagement without cutting into the bearing surface at either end and without interference with the large flange. This was solved by the adoption of a special cam-operated attachment which controls rate of engagement and depth of cut.

As mentioned earlier, it was found at the start of production that hardening of the gear blank before hobbing and shaving was essential in promoting dimensional accuracy and fine surface finish, the determining factors in the durability of the mating gears. More recently, however, considerable work has been conducted in studying the possibilities of surface finish treatment on gears that are hobbled and shaved in the green and induction-hardened after shaving. The production department is now experimenting with several alternative methods of surface finishing that have given good results and it is quite likely that hobbing and shaving in the green will be adopted in the near future.

It is obvious that this procedure will greatly simplify hobbing and shaving operations, will increase productivity, and above all will be effective in further increasing cutter and hob life quite materially.

The mating bronze gear is produced by conventional methods. However, it too required some special arrangements in tooling for production. As illustrated, this gear is quite small and if handled as an individual piece would pose a problem of chucking for hobbing and shaving. By advance planning, it was possible to combine two gear blanks into a single double-end blank, having the gears at the outer ends very much like a small dumbbell.

The gear ends are hobbled in Barber-Colman hobbing machines, one end at a time, then shaved in a Red Ring gear shaver. During hobbing and shaving, one side is completed first, then the blank is turned end for end to finish the other side.

Some of the significant gear data on the bronze driven gear are as follows:

No. teeth, 11.
Normal pitch, 18.
P.D., 0.71692 in.
Helix angle, 31 deg, 31 min, 32 sec, L.H.
Normal pressure angle, 20 deg.
Addendum, 0.0715 in.
Full depth, 0.1309 in.



MERCURY Deluxe Cab for Huskie and Super Huskie TRACTORS *rides smoother on* **TUTHILL** *Alloy Steel SPRINGS*

Every detail of this deluxe cab was specially designed for extra operator-comfort in industrial use. And Mercury tractors use TUTHILL Springs to stand up under continuous, heavy-duty hauling and constant road-and-load shock. There's a TUTHILL SPRING for you from a wide range of stock sizes and types—or specially designed—to *serve your purpose better!*

TUTHILL skill in solving special load problems is at your service. For unique problems or conventional installations—consult TUTHILL first!



TUTHILL SPRING CO.

760 WEST POLK STREET • CHICAGO 7, ILLINOIS



"DETROIT" Universal Joints . . .



. . . Carry the Load for
Numerous Types of Vehicles

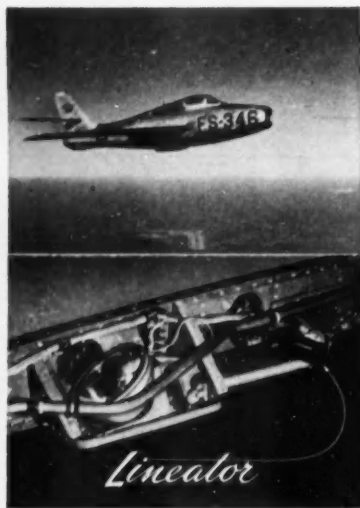
"DETROIT" Universal Joints have an enviable service record in practically every field of power transmission—cars, trucks, tractors, military vehicles, railroad equipment, mine locomotives, power take-offs and other applications. They *must* be dependable.

DETROIT
UNIVERSAL JOINTS



UNIVERSAL PRODUCTS COMPANY, Inc., Dearborn, Michigan

LINEATOR fills Thunderstreak design need



Republic engineers needed an actuator for the landing light retractor in the F-84F fighter. With space too limited for any standard light retractor, they designed their own and specified the R-244M13 Lineator. Its compact design and 250-lb. rating do the job.

The adaptability of Airborne electromechanical actuators is evidenced by wide use throughout the aircraft field.

Perhaps you have a design problem where space and power are factors. See our literature in the I.A.S. Aeronautical Engineering Catalog, or write direct to us.

AIRBORNE
ACCESSORIES CORPORATION

1414 Chestnut Avenue
Hillside 5, New Jersey

Car Air Conditioning

(Continued from page 67)

prepared to meet the situation as it develops and take immediate steps in their own communities to operate without hampering Code restrictions. Wherever action is required, it should be handled by concerted action through NADA on a national level, on a state level, and on a local level. AMA has complete documentation bearing on this matter and will be glad to provide the local organizations with this material.

What is the position of the motor vehicle industry? Since air conditioning is an integral part of a motor car and because motor cars are ambulatory in nature, i.e., they move freely through cities and over state boundary lines, it falls naturally within the regulatory authority now exercised by the state motor vehicle administrative authorities. It is a matter of public interest and safety much the same as are safety glass, brakes, lighting equipment, and other parts and accessories.

To solidify this position, AMA has taken the same steps as it has in the case of other automotive components, which are as follows:

1. The Committee on Engineering and Vehicle Inspection of the American Association of Motor Vehicle Administrators was requested to consider proper control of this type of equipment.

2. The Society of Automotive Engineers appointed a special sub-committee which developed a recommended practice for design and installation of air conditioning and refrigeration units in motor cars.

3. The National Committee on Uniform Traffic Laws and Ordinances appointed a special sub-committee, comprising state and federal motor vehicle officials, motor vehicle industry representatives, refrigeration industry representatives, and representatives from automobile clubs, insurance companies, motor bus operators and motor vehicle dealers, to study the problem and make recommendations for an additional section in Act V of the Uniform Code to govern air conditioning and refrigeration installations in motor vehicles.

What is the risk involved in the application of an existing City Code, such as the Detroit Ordinance before it was amended? The Detroit Code requires that a person, firm, partnership, association or corporation hold a refrigeration contractor's license before being permitted to install,

(Turn to page 106, please)

ANY PLANT

IS THE RIGHT SIZE



Sperry Reflectoscope in use at the Ampco Metal, Inc., plant, Milwaukee, Wis.

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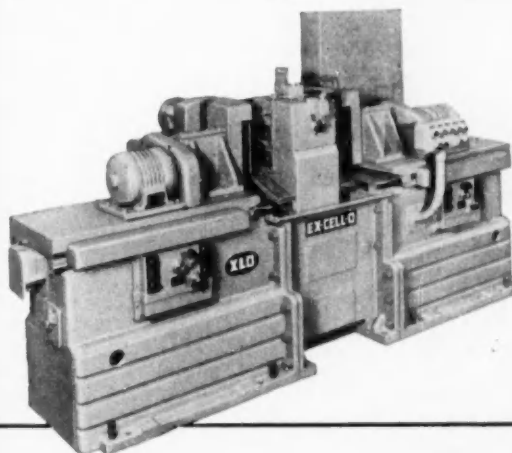
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822

PIECES PER HOUR



Photo above shows one of the die-cast aluminum workpieces. Arrows point to the bored holes which are held to plus or minus .0005". Four parts are machined during each cycle, netting 822 pieces per hour.



FROM THIS

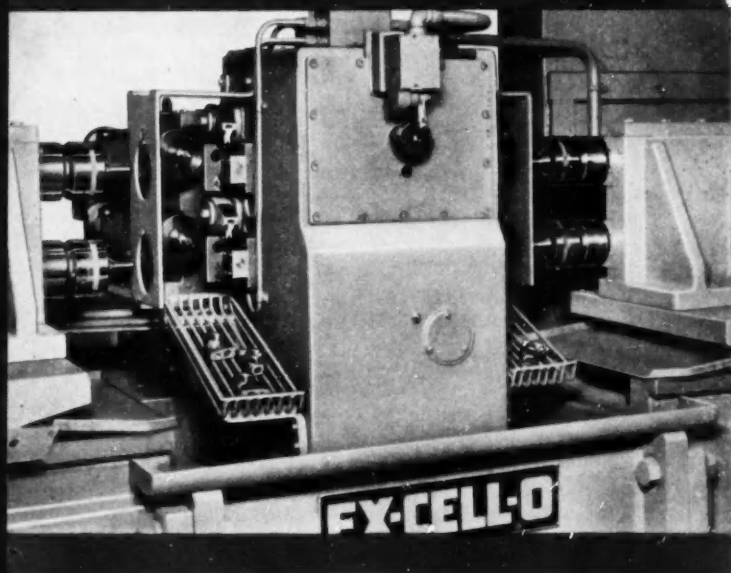
EX-CELL-O

3-Way Machine

Works From 3 Directions Simultaneously

This Ex-Cell-O three-Way Precision Boring Machine consists of three standard, self-contained way units joined to a center section. The left and right way units have two spindles each, mounted one above the other on angle plate brackets. The rear unit carries four spindles, two on each side. The center section supports a fixture accommodating two parts on each side. Work is clamped and ejected hydraulically.

Ask your local Ex-Cell-O representative about all the other advantages of Ex-Cell-O Way Machines, or write today for Bulletin 31631.



Two parts are held in each side of the fixture. Left and right slides bore $1\frac{1}{16}$ " diameter hole through each part, while rear slide is boring $\frac{5}{16}$ " blind holes at right angles to the others. The work is unclamped and ejected automatically at the end of the machining cycle.

EX-CELL-O CORPORATION

DETROIT, MICHIGAN

MANUFACTURERS OF PRECISION BORING MACHINES • CAPABLE OF BORING
MACHINING FROM ONE END • OR BOTH ENDS • OR BOTH ENDS • AND
AND BORING FROM BOTH ENDS • OR BOTH ENDS • OR BOTH ENDS •

25,000th Lockheed

Lockheed Aircraft Corp. last month built its 25,000th airplane, an F-94C.

The company since its reorganization 1932 has grown to a force of 50,000 running nine assembly lines, fabrication mills, research laboratories, flying fields and allied facilities embracing 1570 acres in two states. It builds 12 types of aircraft.

Production this year will approximate \$765 million in commercial and military planes. That tops the record for the entire industry for any pre-war year.

Starting Jet Engines

(Continued from page 52)

Merlin supercharger, driven by the unsupercharged Merlin engine, supplied air. Although this supercharger has a smaller airflow rating than the Palouste, its capacity was sufficient for the successful development of design data for the valve and its controls.

In operation the Palouste control valve showed that its one weakness was its inability to correct for system

failure. Silicone hoses were used in the ducting system to accommodate the high operating air temperatures. Hose connections were difficult to maintain because of the very low friction coefficient and unfavorable set characteristics of the material. During the testing, one of these hose connections failed. Since the bleed airflow of the Palouste was no longer limited by the air starter back pressure, the airflow exceeded all limits. This caused serious burning of the first-stage turbine blades because the overtemperature condition could not be corrected rapidly enough manually. This contingency is being anticipated by adding an overriding control circuit for the valve actuator which will close the main shut-off valve and open the by-pass valve whenever an overtemperature condition is sensed by thermocouples in the exhaust duct. For an alternate basic valve design, this control could be accomplished by sensing an increasing rate of bleed airflow.

Future Development

The Palouste turbo-compressor that has been discussed here is Model I. A Model II version has now been developed which incorporates an automatic bleed valve. This is the first step in the attainment of a completely automatic machine.

Another application of the Palouste now being considered by Northrop is a combination ground starting power unit and on-board equipment cooling unit. Here, except for the short interval of time when air is required for starting, the output of the Palouste is fed into an air-cycle refrigeration system and then ducted on board through either ground cooling ports or the inflight cooling air scoops. Units of this sort have been built with a reciprocating engine and, although they featured independence from an electrical power source, their complexity was found undesirable. The Palouste, when matched with the proper air-cycle refrigeration equipment, can produce 20 tons of refrigeration.

In conclusion, it can be said that the Palouste turbo-compressor is well suited as an air source for high power turbojet pneumatic starting systems. Based on this experience, we feel that the Palouste can be satisfactorily applied to many varied problems of energy transmissions. Further, it is the author's opinion that in the near future, pneumatic system will assume an increasingly important place in aircraft and allied fields.

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AND OTHER BALL APPLICATIONS**

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BALLS**

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Precision balls made for your job — available in a variety of materials. Your specifications will receive prompt attention in our Engineering Department. We are thoroughly experienced in supplying the automotive industry with special bearings, retainers and balls. Let us give you our recommendations.

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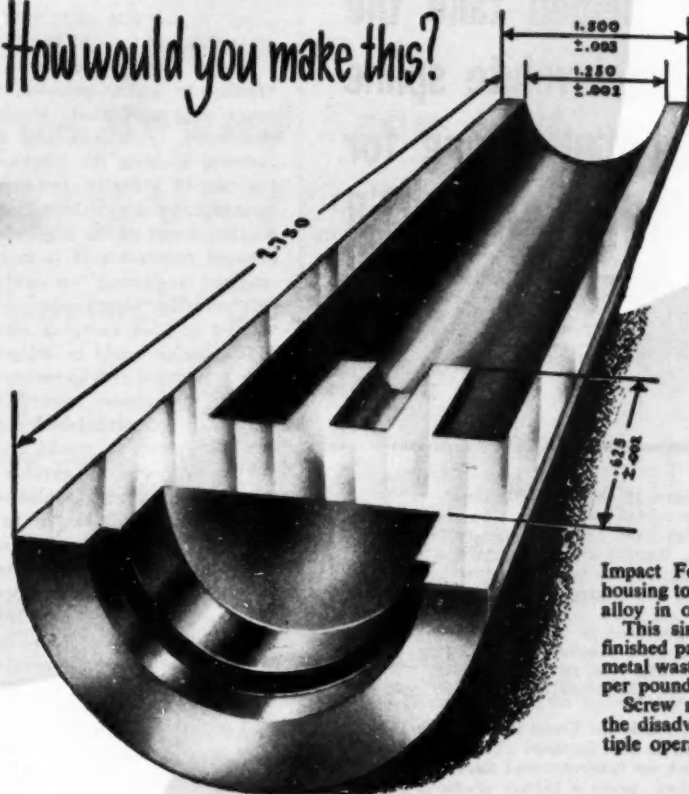
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mr. design engineer...

How would you make this?



PRODUCED

34% cheaper...

7 times faster

Impact Forging reduced cost by forging this housing to print from a heat treatable aluminum alloy in one operation.

This single forging operation has produced finished parts many times faster, with negligible metal waste and increased yield of finished parts per pound of aluminum.

Screw machine production, by contrast, has the disadvantages of high cost bar stock, multiple operations and high metal waste.

IMPACT FORGING

—from HIGH STRENGTH ALUMINUM ALLOYS

Impact forging with high strength aluminum alloys is a new production technique perfected by Hunter Douglas. This new process produces parts with excellent tolerances, surface finish, and superior physical properties. In many cases production machining can be eliminated entirely; in every case machining is held to an absolute minimum. High strength parts of such alloys as 14ST6 ready for final assembly have been delivered at prices less than the cost of the bar stock alone when using ordinary methods.

Millions of impact forgings produced to date at low unit cost has proven the adaptability of impact forging to mass production requirements.

If you are now designing or producing a part requiring the properties of a forging, walls of zero draft, and close dimensional tolerances, let the Hunter Douglas engineering staff show you how you may reduce unit cost with aluminum impact forgings. Your blueprints, specifications, or sample parts will receive prompt analysis.



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VINCO helped take the "guess" out of involute spline manufacturing and gaging for INTERNATIONAL HARVESTER

Mr. Leon W. DeVos
Vincos Corporation
9111 Schaefer Highway
Detroit 28, Michigan

Dear Mr. DeVos:

Since early 1950 you and other members of the Vincos Corporation have been working closely with representatives of our Company in solving the many complex problems involved in the design, manufacture, and inspection of involute splines. During that time you and your associates have been extremely helpful to us in taking the "guess" out of involute spline manufacturing and gaging.

Because such conferences with you have been so productive, meetings of this kind are now a "must" in our farm tractor manufacturing operations. Subsequent discussions have been most helpful in establishing designs and gages for our transmission shafts and gears.

We wish to take this opportunity to thank the Vincos Corporation for the fine cooperation it has extended to our Company. This is just another example of how companies such as International Harvester and its suppliers can, by working together, produce better products for a better America.

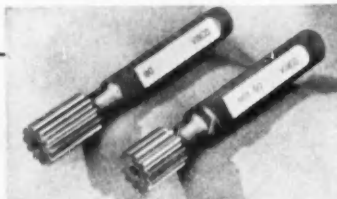
Sincerely,

Eric A. Wolfram
Eric A. Wolfram

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So if your next production program involves splines, call in a Vincos field engineer. He will save you both time and money.

VINCO CORPORATION
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VINCO, the country's largest spline gage manufacturer, produces all types of involute, serration and straight sided spline plug and ring gages.

THE TRADEMARK OF DEPENDABILITY

VINCO

MILLIONTHS OF AN
INCH FOR SALE

Car Air Conditioning

(Continued from page 102)

alter, or service any refrigerating system in the City of Detroit.

If the Code were to be applied broadly to motor vehicles, it would cause unprecedented hardships to customers, to dealers, and to manufacturer making the installation. In the case of a dealer, for example, no mechanical work could be done on the engine except under supervision of a licensed contractor if it involved operations requiring removal of the refrigeration compressor or disconnecting of lines carrying refrigerant.

The dealer would be obliged to employ a licensed refrigeration contractor for this purpose, regardless of the volume of air-conditioned cars in his establishment. It would involve an unnecessary and unbearable expense to the dealer and would shift an equally unbearable charge to the customer for even minor tinkering repairs and adjustments to the engine.

Automobile manufacturers too could be subjected to the same interpretation of the Code and would be obliged to have installations supervised by a licensed refrigeration contractor. Altogether it could become an untenable situation if steps were not taken immediately to correct it.

It is of interest from the standpoint of public safety that nation-wide Codes are based upon the provisions of the American Standard Safety Code for Mechanical Refrigeration, B9.1, and according to a report in the August, 1953 issue of *Standardization*, organ of the American Standards Association (ASA), refrigeration (Turn to page 110, please)

Helicopter Rotor Hub

(Continued from page 59)

of uses. Both feature a wide permissible center of gravity travel which eases loading.

Altogether, 20 Torrington needle bearings are used in the Doman main rotor (Fig. 1) and one in the tail rotor (Fig. 2). There are 10 DC type needle bearings in the planet reduction gears: one on the upper tracta shaft; two on the lower tracta shaft; four on the azimuth gimbal; two on the rotor trachometer generator shaft; and one on the oil pump shaft. Another is mounted on the drive shaft of the tail rotor next to the constant velocity universal joint.



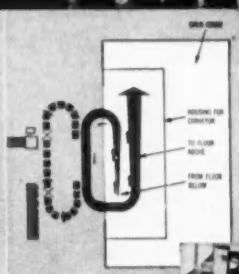
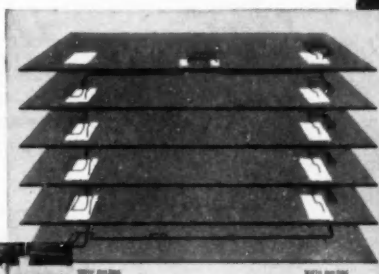
WEBB

Power and Free CONVEYORS

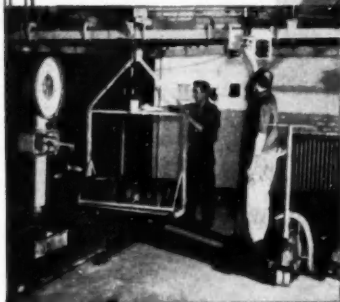
"Unstack" Six Floors

Key:

- Main Conveyor
- - - Loading Station

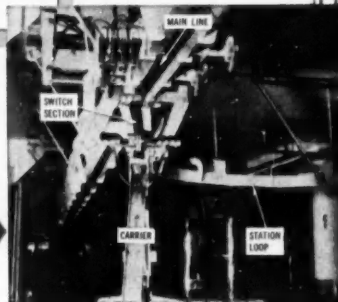


How a
loading station
works.



Operator (right) pushes button to automatically switch next empty carrier from main line to his station loop. Man at left dials on selector switch the destination of loaded carrier.

Note automatic switch for channeling proper carriers from main line to station loop.



With Webb "Power" and "Free" conveyor system Stewart-Warner now gets the benefits of single-story operation in their multi-story buildings. The conveyor system will pay for itself through savings in *indirect* labor costs alone (truckers, elevator operators, stock chasers). Perhaps even greater benefits are derived from the savings afforded by lower inventory and improved production scheduling through:

- More effective supervision of materials handling • Less damaged parts
- Speedier parts delivery between operations • Fewer misplaced loads
- Better and controlled utilization of fork trucks and elevators

This conveyor system, which is 2099 feet long, can be adjusted to run at any speed from 10 to 60 fpm. Selector switches on each carrier automatically switch carriers off main line onto selected station loop for storage, loading or unloading. In addition, station operators by simply pushing a button at their station can switch empty carriers into their loop. Conveyors inclined 30° ascend and descend between floors in housings made of light structural steel and located in two open courts.

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Send for fully illustrated catalog that provides complete information on Webb conveyors.

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The expert's materials work with him!

Superior skill lies behind the shots of the pistol expert. But, he's also sensitive to the weights and balances of his gun. Sights, mechanism, the length and bore of the barrel—each has an important function—each is made with care and accuracy.

The pistol expert takes pains to be certain that the materials of his trade are working *for* him and *with* him.

→
*Add this Spec to
Your Blueprints*

Memorandum

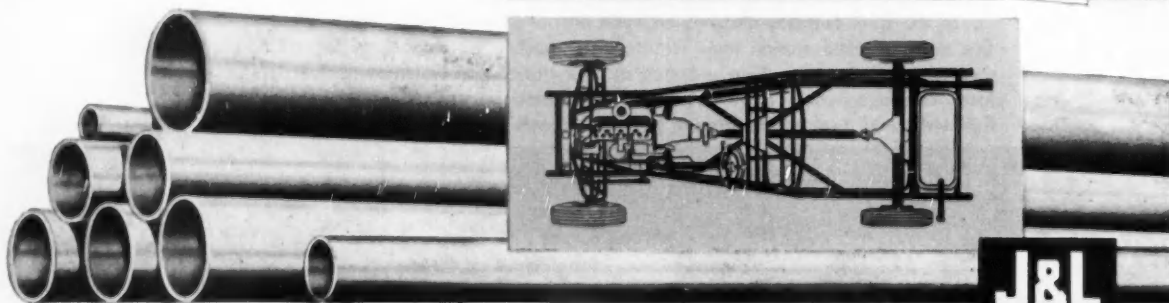
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You can depend upon J&L Electricweld Tubing for:

1. Uniform wall thickness (easy forming)
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3. Ductility (easier, faster fabrication)
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5. Smooth surface (ideal base for electro-plating, enameling, and painting)
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WHEN YOU NEED TECHNICAL ASSISTANCE . . .
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PITTSBURGH 30, PA.

**J&L
STEEL**

Sulphur Surface Treatment Increases Wear Resistance

A SULPHUR surface treatment for iron and steel, developed in France and now in use in that country, is said to provide better resistance to wear without increasing hardness.

Known as "Sulfinuz," the treatment is carried out in a salt bath at a temperature of 1055 to 1075 F, the duration varying from 20 minutes to three hours, according to the parts, the metal used, and the degree of protection against wear that is required. The general principle of the Sulfinuz treatment consists in the incorporation of a sulphur base, the case attaining a depth of about 0.012 in. The process can be applied to all kinds of cast iron or steels, whether straight carbon or alloy, and to stainless steels.

As the treatment takes place at temperatures which do not exceed 1075 F, there is a minimum of distortion, so that in practically all cases the treatment is carried out on the fully finished part and there is no necessity to provide for a grinding operation afterwards.

The bath has a foundation composed of salts without any direct chemical action, but which have the comparatively low point of fusion of 842 F. The active part of the bath is composed of salts which include molecules of sulphur incompletely oxidized and maintained in an adequate state in a reducing medium. The general operation of the furnaces, handling, cost, etc., are about the same as for liquid casehardening.

The action of the bath produces two effects: an alteration of the surface of the part, a grain appearing which varies according to the nature of the metal and the duration of the treatment; also there is a depth penetration. The grain is produced by corrosion.

The process has a wide application and is being applied to drills and cutting tools. For automobile work its most direct application is for cylinder liners and piston rings, and for the treatment of iron parts replacing bronze bushings. In the Paris district the Partiot Heat Treatment Co. has the rights for the process and last month treated 137,000 parts weighing in all about 40 tons. Among the parts being treated are cylinder liners for Panhard aircooled two and 12 cyl engines, and for Willeme Diesel truck engines; also valve rockers for Bernard stationary engines and for Unic truck engines, the bronze bushing being eliminated in these treated rockers.

A feature of the self-lubricating qualities obtained by the Sulfinuz process is a short running-in period. Tests carried out in the laboratory of the Wellsworthy Piston Ring Co. in England, with a chrome-nickel, centrifugally-cast iron liner and a liner of ordinary cast iron treated by the Sulfinuz process, showed that after the first two hours of running the wear on the chrome-nickel liner was too slight to be measured,

FOR LOW-COST

TORQUE CONVERTER COOLING...

USE STANDARDIZED HEAT EXCHANGERS

BY **YOUNG**



Young-built fluid coolers were original equipment on some of the first torque converter installations, and have been thoroughly tested under actual operating conditions. Illustrated above is one of three types of coolers now in service on the nation's "big name" equipment. Their shell and tube bundle design means easier maintenance—longer, more efficient service without clogging. Check with Young Engineering Service on your specific requirements; Young standardized units pay-off in low-cost heat transfer.

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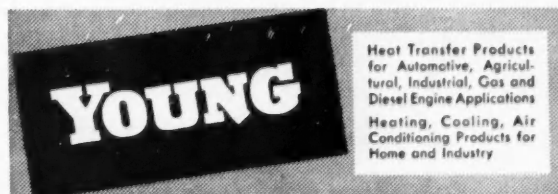


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CONDITIONING PRODUCTS FOR
HOME AND INDUSTRY.

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Leaders in Heat Transfer Engineering for more than 25 years



Yes, the Ransburg story of cutting painting costs to a fraction of the cost of other methods does sound good. It is good!

On most factory production lines, the Ransburg electro-coating processes will provide 2 to 4 times more parts per gallon of paint—automatically—with one operator doing the work of many.

That's because the Ransburg No. 2 Process is the most efficient spray coating process ever developed for industry's use.

If you are a manufacturer of painted products, and if your work volume warrants conveyORIZED painting, we'd like to tell you more about the production efficiency of the RANSBURG No. 2 PROCESS as it applies to YOUR production. Too, we'd like to show you typical examples of customers' production lines where the Ransburg No. 2 Process is setting new quality standards... increasing production... and at the same time, saving manpower, money and materials.

Write for literature, or send for "Miracles In Painting"—our new 16mm. sound and color movie which shows on-the-job examples of Ransburg Processes at work in industrial plants all over the nation.



Ransburg

ELECTRO-COATING CORP.

INDIANAPOLIS 7, INDIANA

while that on the treated liner was 0.0008 in. After 500 hours running, the chrome-nickel liner showed 0.003 in. wear, while wear on the Sulfinuz treated liner was about 0.001 in.

In another test a four-cyl gasoline engine had two cylinders fitted with Sulfinuz treated liners and rings, while the other two cylinders had non-treated liners and rings. After 40,000 miles the standard liners showed four times as much wear as the Sulfinuz treated liners, and the standard rings had worn 16 times as much as the ones that were Sulfinuzed.

For the last three years a manufacturer of Hele-Shaw disk clutches has used steel plates throughout, both sets being treated by the Sulfinuz process. This, obviously, results in a great reduction in material costs.

Car Air Conditioning

(Continued from page 106)

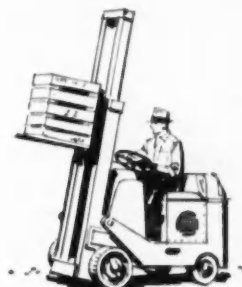
eration equipment manufactured to conform to its provisions can now be installed in 850 governmental jurisdictions without special alterations to conform with local ordinances. In creating this National standard, manufacturers were concerned lest a variety of safety rules throughout the country place unnecessary restrictions on their operations. Incidentally, the ASA says that the Code's requirements apply only to the "occupancy" classifications that are listed.

One of the most important provisions of the Code and one that aptly applies to motor car air conditioning is the definition of Group 1 refrigerants. Group 1 refrigerants are those that are non-toxic, and non-flammable (including many varieties of Freon as well as other accepted types), hence offer no hazards in the event of a leak or a break in the system in case of accident. Without exception, the refrigerants used in motor car air conditioning units are of Group 1 type.

It is understood that no undue hazard exists with such refrigerants, even if a leak developed while a car was on the road, or while it was being repaired in a service station. Consequently, there is no added hazard from the standpoint of public safety. In fact, the amended Detroit Code specifically mentions that the exemption applies to systems employing Group 1 refrigerants.

It may be mentioned at this point that all automobile manufacturers

(Turn to page 114, please)



F*ine* performance
is combined with
low cost in the
Long Torque Converter

**LONG MANUFACTURING DIVISION • BORG-WARNER CORPORATION
DETROIT, MICH. AND WINDSOR, ONT.**



TORQUE CONVERTERS • CLUTCHES • RADIATORS • OIL COOLERS

METALS—

(Continued from page 94)

Lead Position Satisfactory

Lead producers were tolerably well satisfied with their position in September, in contrast with their unhappy brethren in the zinc industry and their jittery cousins in copper. Demand remained quite good with the price apparently stabilized at 14 cents per lb. Pressure of foreign lead on the

domestic market has eased and Europe was reported to be buying the metal in volume.

However, purchasing agents are not buying ahead and the secondary smelters are not reaching for scrap, which has been in good supply. Shipments of automotive replacement batteries registered their usual seasonal rise in July and totaled 2,533,000 units, about the same as July, 1952.

Lead imports continue high at about 58,000 tons per month, but the rate is no greater than the monthly average of 1952. Consumption of lead in all forms in the first half of

1953 was highly satisfactory at nearly 600,000 tons, 12 per cent more than in the same period of last year. Important gains were shown for use in tetraethyl fluid. Consumers' stocks of lead increased to 138,900 tons at the end of June, an all-time high since 1948.

Zinc Industry Depressed

After six weeks of trial of the new pricing system for zinc, under which the seller offered the metal at a flat 11½ cents per lb rate to all eastern consuming points, the American Smelting & Refining Co. returned to the traditional East St. Louis basis, with freight to be paid by the buyer. At the same time, the company cut the price of Prime Western to 10½ cents per lb, and later to 10 cents, a new low for the metal since December, 1946, and a 45 per cent decline from the 19½ cent price that held until June, 1952, when the long, virtually uninterrupted decline began. Other sellers followed suit and for all practical purposes the market returned to an East St. Louis base.

Sentiment in the zinc trade remains predominantly pessimistic. Failure of the price to improve from a 10½-11 cent level for more than six months has producers singing the blues. Few domestic mines can break even at present prices. To add to their woes, the unions have demanded, and in most cases, obtained an 8½ cent per hr wage increase.

August statistics gave no encouragement to the trade. Shipments declined while production of slab increased over July. Stocks of metal rose to a lofty total of 117,900 tons and unfilled orders showed no improvement. Some of this can be explained by seasonal lull in consumption because of the summer vacation period.

Imports Continue at Record Breaking Rate

Further uneasiness arose when June figures were released showing that imports of zinc as refined metal and concentrates had climbed to a record total of 84,200 tons. The June imports compare with a monthly average of 63,700 tons in the first half of 1953 and an average of 47,000 tons per month in 1952.

Possibly over-emphasis is placed on the June figures. Obviously, they don't represent the present import rate which is probably less. June imports were stimulated by the frantic desire of foreign zinc producers to ship their metal to the U. S. before the anti-

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SINCE the day of the duster and goggles, The Brown Corp. has meant highest quality precision parts for the automotive industry. Today, Brown Parts serve trucks, tractors, trailers, buses, axle builders, off-the-road machines and Diesel locomotives. The production methods and facilities we have developed are unexcelled—uniform product quality is assured—deliveries are reliable—service is efficient. Ask any of our long list of satisfied customers throughout the industry.

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. . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

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But now, our Special Machinery Division has new and greatly expanded facilities. Its exclusive job will be to build special machine tools and tooling or to specially adapt standard equipment to solve specific metalworking problems.

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EXPERIENCE: We've been in the business 55 years. In addition to being one of the country's leading producers of standard milling machines . . . *our annual production of special machinery has ranged up to \$3,000,000.*

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PERFORMANCE: Kearney & Trecker's Special Machinery Division is best recommended by its record of successfully solving hundreds of unusual machining problems. These solutions required provision of high productive capacity as well as exacting dimensional accuracies and surface finishes.

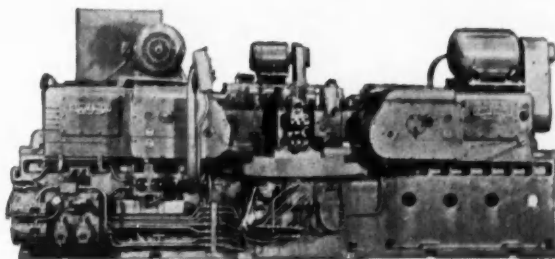
RESPONSIBILITY: Our Special Machinery Division is an integral part of the Kearney & Trecker Corporation . . . and is fully supported by all its financial, physical and personnel resources.

Any commitment for a product of this Division is a commitment that fully involves the accepted reputation for responsibility and satisfaction that is Kearney & Trecker's.

We invite your inquiry

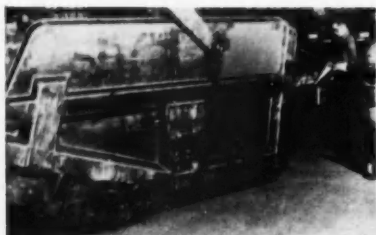
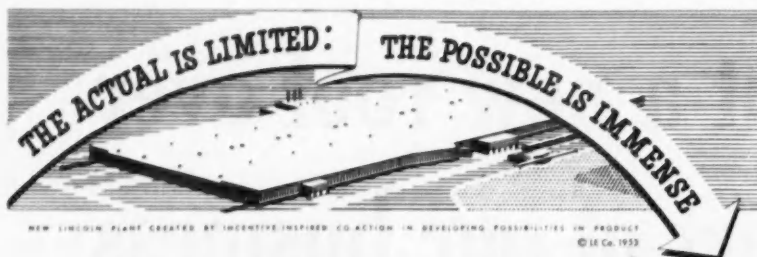
We'll be glad to provide you with any information we can . . . including sample machine specification sheets on typical installations, a brochure covering the expanded facilities of our Special Machinery Division, and details on our Customer Engineering Service. Furthermore, if you have special production machinery problems, have one of our senior Project Engineers analyze them, without obligation, of course.

Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



We've built special machines or adaptations of standard equipment for practically every industry. Here is a photo of a four-station rotary indexing machine we designed and built for a major automotive manufacturer.





▲ Fig. 1. Welding Manhours 60% Less on side frame for earth mover assembly. With "Manual Lincolnweld", sides are finished in 16 manhours... formerly took 40 manhours, a 60% saving in time. Each side requires 174 feet of welding.



Fig. 2. Simpler to Set Up. Components for side frame are tacked in position and welded with "Manual Lincolnweld". Joints too steep for "hidden-arc" welding are welded with coated electrodes.

MANUAL LINCOLNWELD CUTS WELDING TIME 50%

"HIDDEN-ARC" welding using "Manual Lincolnweld" is cutting welding time 50% and more on many components for Gar Wood earth movers. On some jobs, overall welding time has been reduced as much as 67% because of less warpage, lower set-up time and greater freedom from weld spatter.

Strength and quality of welds produced with "Manual Lincolnweld" are equal to fully automatic welding. Setup time, however, is less since the work can be welded in the tacking position, and the welding gun of "Manual Lincolnweld" can be used in any flat or near-flat position.



Manual Lincolnweld concentrates up to 600 amps on a 1/4" electrode. Welds 3 to 4 times faster. Welds are smooth and practically self cleaning.

In the fabrication of these Gar Wood side frames, two men produce one pair of frames in only 8 hours. Each frame calls for 174 feet of welding. With hand welding 40 manhours were formerly required to do this work.

Duplicate benches are used for fabricating the right hand and left side frames. Two men working as a team set up, tack, and weld, using the "Manual Lincolnweld" for both "hidden-arc" and open arc welds.

Start cutting costs today. "Manual Lincolnweld" procedures and speeds are presented in Bulletin 1303. Write on your letterhead to Dept. 2204.

THE LINCOLN ELECTRIC COMPANY

CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

pated sliding scale tariff went into effect.

Brass Prices Reduced

Early in September Revere Copper & Brass took a long-expected step and announced an immediate reduction on all its fabricated products to be predicated on a 30 cent price for copper and current prices for zinc, lead, tin and other alloying elements. For many months, such prices had been based on 32.6 cents per lb for copper, a legacy from the old 60-40 basis of OPS. The move was quickly followed by other fabricators in the field.

Car Air Conditioning

(Continued from page 110)

who supply air conditioning have instituted organized schools for training service personnel in the installation and repair of such equipment. Being in business for some 50 years, the motor car industry is secure in the conviction that it has developed the proper know-how for training its service mechanics to handle any special equipment that may be developed for motor cars. It has successfully overcome the problems of launching such intricate mechanism as automatic transmissions and power steering and appears to be fully competent to handle air conditioning or anything else that may come into the picture.

Moreover, it is quite reasonable to expect that cooperating refrigeration contractors may find themselves in the automobile air conditioning business in the long run. Many service stations and dealer establishments today find it expedient and good business to refer radio repairs to a specialist outside their own shop. It is quite possible that at least the many smaller dealers and repair shops will find it desirable to refer air conditioning overhauls and repairs to competent refrigeration experts if their own operation does not warrant the know-how and equipment required to do the job.

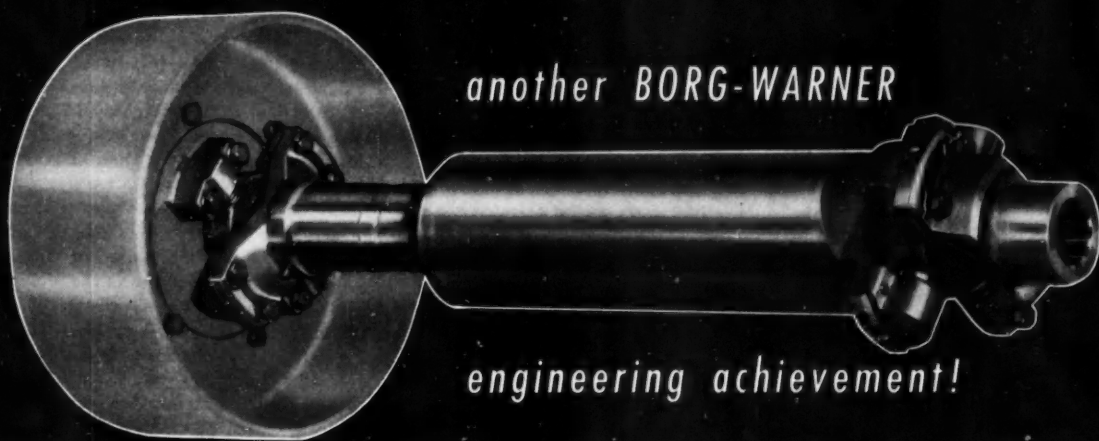
In any event, car air conditioning appears to be a fast growing business and it is well for everyone concerned with selling cars and servicing them to make sure there are no road blocks in their various communities. If you need help just call on AMA.

AUTOMOTIVE INDUSTRIES

Keeps You Informed

AUTOMOTIVE INDUSTRIES, October 1, 1953

Best Truck Joint on the Road!



Trucks pay out *on the road*—not in the shop!

That's why Borg-Warner designed and perfected MECHANICS Roller Bearing Universal Joints for trucks with *special* emphasis on simpler, speedier assembly and servicing, smoother running balance, longer trouble-free operation.

MECHANICS truck type joint attaches to the transmission independent of the transmission brake attachment. Either joint or drum can be serviced independent of the other, and without disturbing

other attachments or altering original factory balance.

That means *less shop time—more road time*. And that's why so many truck makers, fleet owners and other operators *prefer* MECHANICS Roller Bearing Universal Joints.

Developed, engineered and produced by Borg-Warner's Mechanics Universal Joint Division, this specially designed truck type joint is another outstanding example of how B-W ingenuity serves the automotive industry—every day.

Almost every American benefits every day from the 185 products made by



ENGINEERING MAKES IT WORK



PRODUCTION MAKES IT AVAILABLE



BORG-WARNER

THESE UNITS FORM BORG-WARNER, Executive Offices, Chicago: ATKINS SAW • BORG & BECK • BORG-WARNER INTERNATIONAL • BORG-WARNER SERVICE PARTS • CALUMET STEEL • CLEVELAND COMMUTATOR • DETROIT GEAR • FRANKLIN STEEL • INGERSOLL PRODUCTS • INGERSOLL STEEL • LONG MANUFACTURING • LONG MANUFACTURING CO. LTD. • MARBON • MARVEL SCHEBLER PRODUCTS • MECHANICS UNIVERSAL JOINT • MORSE CHAIN • MORSE CHAIN CO. LTD. • NORGE • NORGE HEAT • PESCO PRODUCTS • REFLECTAL • ROCKFORD CLUTCH • SPRING DIVISION • WARNER AUTOMOTIVE PARTS • WARNER GEAR • WARNER GEAR CO. LTD. • WOOSTER DIVISION

New British Planes

(Continued from page 61)

operation. Further developments cover a longer version, the Vicount 800, with an improved Dart engine. This model has a span of 94 ft, length 81 ft, two in., gross weight of 52,000 lb and a maximum speed of 340 mph.

The center of interest at the show undoubtedly was the four-engine jet bombers known as the "V Bombers"—Victor by Handley Page, Valiant by

Vickers, and Vulcan by Avro. These three will be developed from the bomber to the liner class, but already they put Britain into a strong position from a military standpoint. The Handley Page Victor is a crescent wing plane which has been given super-priority in production for R.A.F. bomber command. It is claimed that no bomber flies as fast, as far and as high with a given bomb load. The crescent wing design is said to reduce drag at high speeds and great heights, and give good control and stability throughout the

speed range. The angle of sweep-back is progressively reduced towards the wing tips. Near the fuselage the wing is broad and deep enough to receive the engines, fuel tanks, and undercarriages. It becomes thinner, narrower and straighter near the tips. The inter-continental passenger version, known as the H.P. 97, will be a pressurized double-decker with passenger accommodation for 95 to 150 people, or a payload of 22 tons. Some of the features noted on the two machines shown in flight were an eight-wheel bogey undercarriage, air brakes moving outwards from the rear of the fuselage to increase drag, two-component leading edge flaps, a cruciform tail arrangement with crescent tail plane, and a cockpit canopy blending with the fuselage contour. The machine on flight display had four Armstrong-Siddeley jet engines.

Vickers - Armstrong has already flown two prototypes of the Valiant four-jet-engine, swept-wing bomber and is now working on the first production lot. The high-wing monoplane has sleek, fighter-like lines, with four buried Rolls-Royce Avon R.A. 14 engines. It is said to be capable of carrying an atom bomb. Developments will cover a troop carrier with different fuselage and larger wings, fitted with the new Rolls-Royce Conway by-pass engines and a trans-Atlantic version known as the V.C. 7.

Delta-wing construction is the characteristic feature of the Avro Vulcan four-jet-engine bomber, which made its first flight in August, 1952. Experimental work carried out since then has been pushed forward by the help of the Avon 707A and 707B single-seat, single-engine deltas, which are exact scale models of the Vulcan. For the first flights use was made of Rolls-Royce Avon engines, now replaced by Armstrong-Siddeley Saphires, with the eventual use of four Bristol Olympus engines.

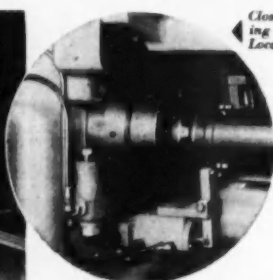
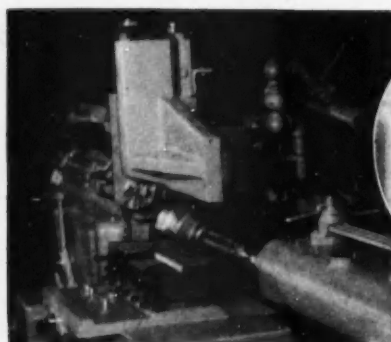
The transport development of the Vulcan will be the Atlantic, intended to make trans-Atlantic flights in five to 5½ hr eastbound and 6½ to seven hr westbound.

Biggest of all British planes, the Saunders-Roe Princess flying boat, made several appearances during the meeting. Although this giant airship has been flying for a year, two other models have been cocooned and the fate of the project is still in doubt.

To assist in the development of swept wings, Short Brothers & Harland have been given an order by the Ministry of Supply for the production of a research aircraft, to investigate problems arising in the handling

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



Close-up view showing Air-operated Locator

Close-up view of machine showing details of Driving Arbor

PRODUCTION SPEEDED ON DRIVE GEAR HUBS WITH MODEL "AR" AUTOMATIC Lo-swing LATHE

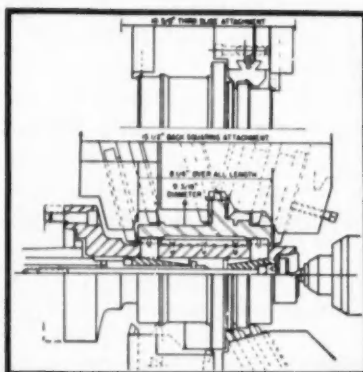
Problem: To automatically turn, face and chamfer shoulders, and cut groove on Gear Hub with 9" Flange diameter, locating and centering from bottom of spline previously machined.

Solution: The Model "AR" Automatic Lo-swing Lathe was selected for this job due to its rigid construction and its demonstrated fine performance with cemented carbide tools.

The expanding, air-operated driver, shown in the line drawing and the main illustration, is fitted with two sets of six driving jaws which accurately center the part true with the bottom of the splines. The jaws are actuated with two independently-expanding bushings and pull bars which equalize the pressure on both sets of jaws. The parts are located longitudinally on the arbor by an automatic, air-operated locator, which moves forward to the exact locating position when the tail-stock spindle is withdrawn and relieves when the spindle is advanced.

All diameters are turned with the tooling mounted on the front carriage slide. The squaring, chamfering and grooving operations are divided between the rear and vertical slides in order to simplify the tooling which is used for several different sizes of hubs. The line drawing shows the tooling in detail.

Consult our Engineering Department for Automatic Lo-swing Lathes engineered for your particular turning problems.

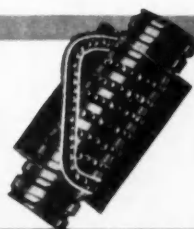


SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

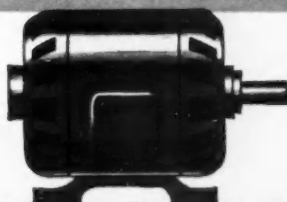
PRODUCTION COSTS ARE LOWER WITH Lo-swing

To MOVE with less EFFORT

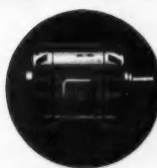
BALL-SCREW ACTUATORS



REDUCE THIS



TO THIS



If you could take about 80% of the friction out of your moving device, you could vastly reduce the size of motor needed.

Our ball-screw actuator is a combination of the screw (for power) and balls (for friction-free movement).

Many U. S. airplanes have installations of our ball-screw actuators. They have been used to help replace big motors with small ones; to improve control of motion; to eliminate human work required to crank something.

Besides saving weight and reducing the cost of friction—besides providing absolutely smooth motion—besides minimizing need for lubrication—the Ball-Screw Actuator permits the precision control of metal to metal. You can stop on a split micron!

We have expanded our capacity so that we can engineer industrial applications now. Write for booklet describing actuators and their uses.

CLEVELAND PNEUMATIC

TOOL COMPANY

DEPT. G-10 • CLEVELAND 5, OHIO

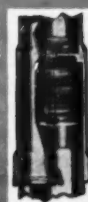
BALL-SCREW ACTUATORS

AIR-OIL SHOCK ABSORBERS

AUTOMOTIVE SHOP EQUIPMENT

To CUSHION SHOCK...

CPT's shock absorber principle combines pneumatic and hydraulic cushioning. It can control minute vibrations or tons of impact. It is the shock absorber for the largest aircraft landing gear (CPT is world's biggest manufacturer of landing gears), but the principle can be adapted to finger-sized units. May we discuss with you how to ease the shock out of stopping or take the motion out of vibration?



WORLD'S LARGEST MANUFACTURER OF AIRCRAFT LANDING GEARS

AUTOMOTIVE INDUSTRIES, October 1, 1953

Ready for you after 12 months of brutal



**CUSTOMER
TESTING!**

CLARK's

New and Exclusive

HYDRATORK DRIVE*

Here's how it improves your fork-truck operation:

- 1 MORE WORK:** faster get-away, positive power without slippage; moves heavy loads and climbs ramps with ease.
- 2 LOWER COST:** higher percentage of "on-the-job" time results from no clutch problems, "cushioning" effect on motor and drive members.
- 3 GREATER SAFETY:** hydraulic brake system, linked to torque converter, automatically cuts power; engine cannot be started unless controls are in neutral.
- 4 IMPROVES DRIVER EFFICIENCY:** finger-tip direction control and elimination of gear-shifting conserves operator energy.

Not one, but *eighteen* HYDRATORK-equipped trucks were placed in customers' plants for a full year of on-the-job testing. Without exception, these units proved that reduction in driver fatigue and of truck downtime results in greater production from HYDRATORK-equipped trucks.

* Now available in
6-7000 lb. capacity
truck

Mail the coupon for detailed
literature which explains
how CLARK's new and
exclusive HYDRATORK
DRIVE operates.

CLARK ELECTRIC, GAS, DIESEL, L.P. GAS FORK TRUCKS AND POWERED HAND TRUCKS - INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 69, MICHIGAN

Please send: ☐ Hydratork literature ☐ Condensed catalog
☐ Have representative call

Name _____

Firm Name _____

Street _____

City _____ Zone _____ State _____

AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

of machines with this type of wing. Equipped with one Rolls-Royce Derwent engine, this plane has a variable external configuration and a fixed undercarriage with a tailplane which can be set high or low on the fin and to any desired angle of incidence. The first stage of the experiments has been with wings sweptback at 50 deg. On the second stage the sweep will be 60 deg and on the third stage 69 deg. Information gained by these experiments will be pooled among British manufacturers.

Largest of the freighters on flying display was the Blackburn Beverley, built to army requirements for quick loading and unloading of heavy equipment. It carries 20 tons of payload in a hold of nearly 6000 cu ft capacity, and its main freight compartment has an unobstructed floor space 40 ft long by 10 ft wide and an overall height of 10 ft. This is the first British military plane designed for dropping heavy military equipment. For this purpose the doors can be removed, allowing guns, tracked vehicles and light trucks to be set down by parachute. Originally having Bristol Hercules engines, four Centaures are now fitted, increasing the power by 3500 hp. Despite its size, this plane can operate from grass strips 1000 yd in length.

Whatever was new in the fighter section was overshadowed by the jet bombers and by their successors the jet passenger planes. The Hawker organization flew three Hunters, including an Avon-powered Mark 1, the original prototype with Avon afterburner and the Mark 2 prototype with Sapphire engine. Javelin presented the third prototype. Naval fighters included the Sea Hawk F. Mk 1 by Armstrong Whitworth, and the impressive De Havilland 110.

Engine development is practically all with jets, the only really new piston engine being the Alvis Leonides Major, a two-row 14 cyl unit developed for helicopter and fixed wing designs. It has an output of 870 hp and many of its components are interchangeable with those of the nine-cyl unit. Two new jets are in the experimental stage. All that is known about the Rolls-Royce Conway is that it is a by-pass engine which has been specified for the Vickers 1000 military long distance transport plane and the civilian version of this for trans-Atlantic flights. De Havilland has the Gyron test and claims that it is the most powerful jet ever produced. De Havilland presented a new assisted take-off rocket motor, the Super Sprite, which weighs 600 lb.

(Turn to page 122, please)

THERE'S MORE TYPE 430

Stainless Steel trim

**ON THE 1953 MODELS
THAN EVER BEFORE**

● Year after year, the use of straight-chromium Type 430 Stainless Steel for interior and exterior trim has been increasing steadily. And it hits a new high on the 1953 models of almost every manufacturer.

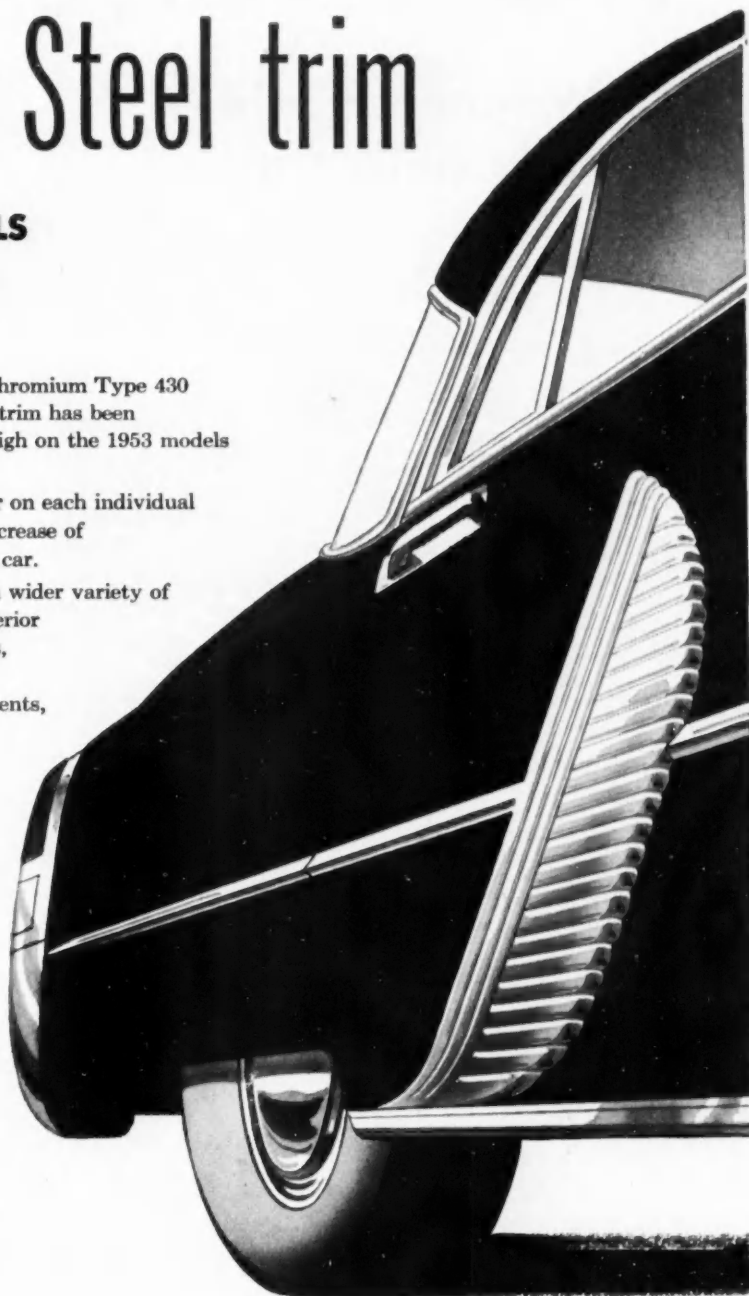
There's more Stainless Steel this year on each individual car . . . one manufacturer reports an increase of more than 25% in Stainless weight per car.

And Stainless Steel is being used in a wider variety of applications, including interior and exterior mouldings, glass channels, wheel covers, hub caps, lamp doors, radiator grilles, door handles, radiator and hood ornaments, stone shields and many more.

Stainless Steel trim is enthusiastically received by car buyers who recognize that its beauty is more than skin deep. Its lasting corrosion resistance and dense, durable surface keep it looking new a long time.

New finishing facilities have helped to speed this switch to Stainless Steel. U·S·S 17 (Type 430) Stainless Steel, used extensively for these applications, is furnished in strip form with a bright mill finish that requires minimum polishing after forming.

For the finest performance, insist on U·S·S 17 Stainless Steel. Our representatives will be glad to work with you in selection of materials and forming methods that best meet your design requirements.



UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
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U·S·S STAINLESS STEEL

SHEETS • STRIP • PLATES • BARS • BILLETS • PIPE TUBES • WIRE • SPECIAL SECTIONS

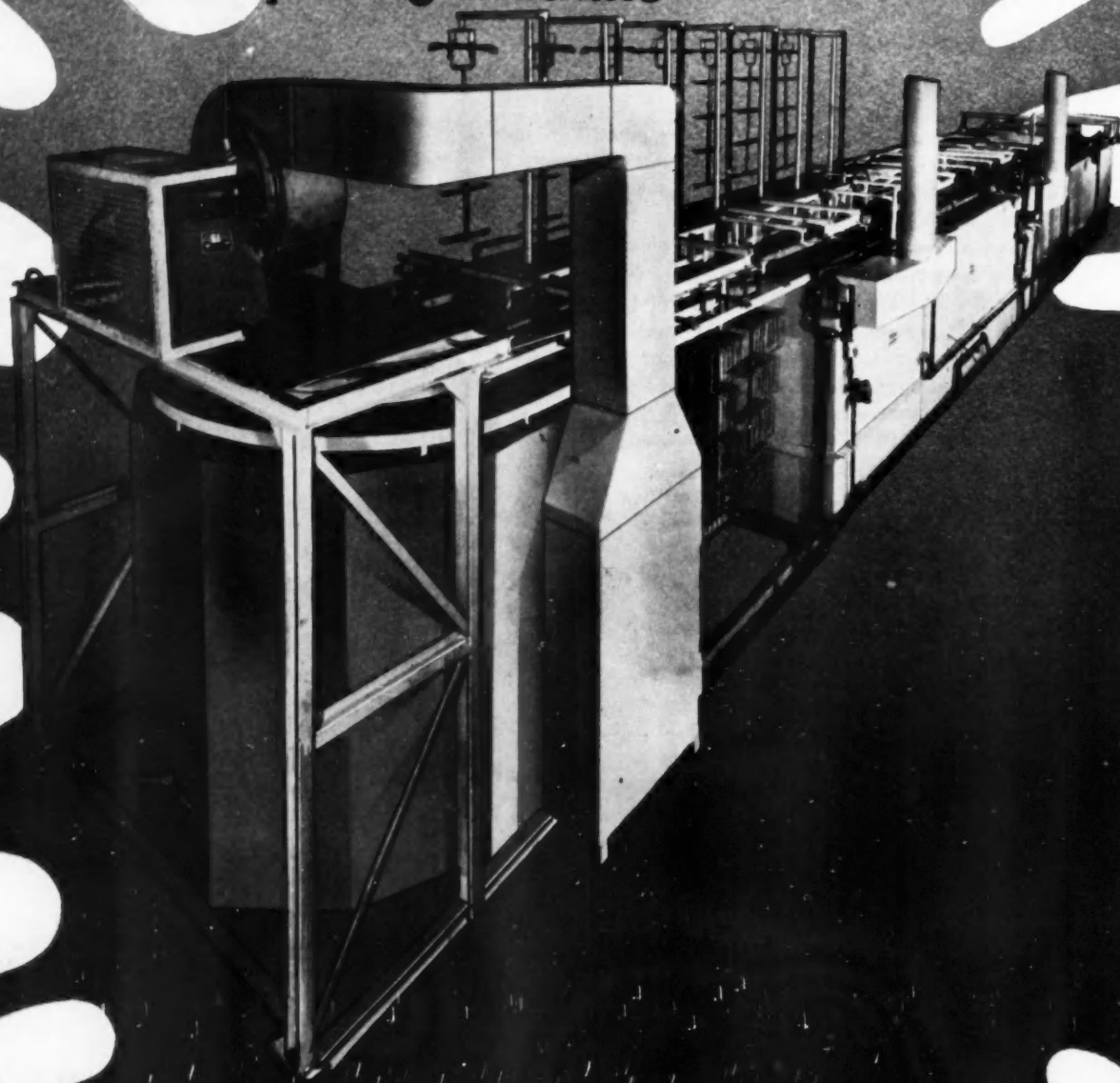


UNITED STATES STEEL

It's a Revolution in

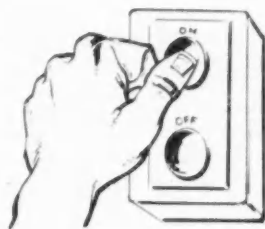


**Wagner Brothers
fully automatic
electroplating machine**



Plating Automation*

A complete new approach to automation in plating—



**Fully Engineered-
Proven Principles-
Now in Plating
Production**

CUTS LABOR — You load it and press the button — your Wagner does the rest.

CUTS DOWNTIME — All working parts are readily accessible for servicing — Built in sections for quick inspection and service without disturbing work or other sections.

CUTS POWER NEEDS — A Wagner Fully Automatic operates on one motor of less than half the power needed for any other electroplating equipment of comparable capacity.

CUTS CONTAMINATION — No grease-loaded mechanisms are located above your tanks, eliminating a major plating problem.

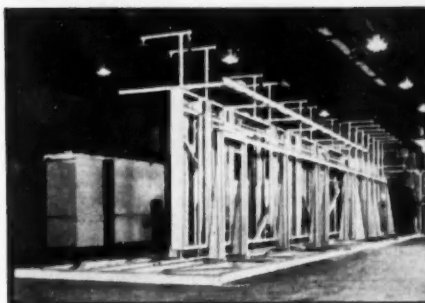
CUTS SPACE NEEDS — Your Wagner Fully Automatic takes less floor space — less ceiling height. For example, it will handle a 48" rack under a 12-foot ceiling.

AND DOZENS OF OTHER cost cutting features. It's all new — It's fully proven — It's in production. It's Wagner Brothers Brand New Fully Automatic Plater.

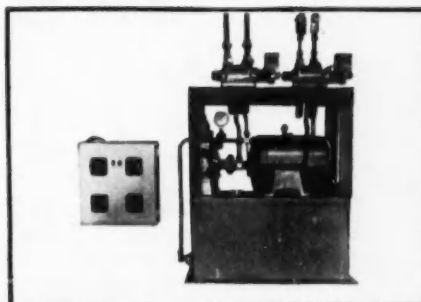
See your nearest Wagner representative or call at once and get complete information on this revolutionary and efficient New Approach to plating automation.



Central lubrication unit (1) at loading station, greases all moving parts while operating. Reciprocating carriage (2) is actuated by simple trouble-free cylinder (3). Decelerating cams (4) operate control valve (5) to assure smooth, long life operation.



The automatic plater being assembled. Note that all lubricated machinery is centrally located—not over tanks—for easy servicing and to preclude contamination of fluid in tanks. This unit is in three sections for economical transportation.



One electric motor supplies all power for the hydraulically driven automatic plater. The power unit and control panel can be installed at any convenient point in the plant for convenience in installation, servicing and operation.

Wagner

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MARKEM**SOLVED THIS MARKING PROBLEM****PRINTING
LABEL INFORMATION
ON CARTRIDGE
ENCLOSED FUSES**

Working closely with Underwriters' Laboratories, Inc. and with leading fuse manufacturers, Markem has developed a method which makes possible for the first time the printing of label information directly on cartridge enclosed fuses at production rates. Markem's direct ink imprints cannot "fall off" and are unaffected by moisture or ordinary chemical atmospheres. Paper label inventory and wastage problems are eliminated. Print is larger and color coding and identification are simplified. Fuse manufacturers anticipate better labeling at higher production rates and with lower costs. The Markem Method—Markem Machine, Markem type and ink and the special recording die roll for use when UL Manifest is required—as well as the imprint itself meet with UL approval.

MARKEM**MARKS THEM ALL****CAN MARKEM
HELP YOU?**

Printing labels directly on cartridge enclosed fuses is but an example of how Markem solves industry's marking problems. Markem has been providing industry with production techniques and equipment to identify, decorate or designate its products, parts and packages since 1911. Markem also provides technically trained men who are available in your area to assure continued satisfaction with Markem methods and equipment.

When you have a marking problem, tell us about it and send a sample of the item to be marked. Perhaps a complete Markem method has already been developed to solve your problem. If not, Markem will work out a practical solution.

Markem Machine Company, Keene 8, N. H., U.S.A.



(Continued from page 118)

and has a duration of about 40 sec and a maximum thrust of 4000 lb. This motor employs hydrogen peroxide with kerosene or gasoline injection, and a new feature is a solid catalyst replacing the liquid potassium permanganate used in the earlier Sprite models. The solid catalyst eliminates the use of a separate permanganate tank and leads to a simplification in the design and greater ease of handling.

Although shown last year, it is claimed that the Napier Nomad compound Diesel is now a much lighter and improved power plant which develops 3135 hp. It has a specific fuel consumption of 0.33 lb/hp/hr and its weight is 3580 lb.

The British Ministry of Supply exhibited two new rocket motors for assisting the take-off of airplanes, the design and production of which had been carried out at the Rocket Propulsion Department of the R.A.F. The Scarab produces a mean thrust of 3000 lb for approximately six sec, giving a total impulse of 20,000 lb-sec, and Ladybird produces a mean thrust of 1500 lb for approximately six sec, giving a total impulse of 10,000 lb-sec. Each motor contains a cordite charge in a steel case.

The Bristol Co. displayed a plastic wing assembled from four high pressure mouldings in asbestos phenolic material and also a drop fuel tank of the same material. These have been developed in the company's plastics department, but no details were revealed.

Helicopter development is comparatively slow, no service as yet being in continuous operation in England. Bristol, however, has supplied the 171 to B.E.A. for cargo service and airline service is being studied. The Bristol 171 is fitted with the Alvis Leonides radial 550 hp engine, driving a rotor with a diameter of 48 ft, 6.7 in. Gross weight is 5300 lb.

The Bristol 173, with 14/16 passenger capacity, has two synchronized Alvis 550 hp engines, each one capable of driving both rotors in case of a failure. This machine has stub wings and is capable of operating on 190 mile stage lengths.

Saunders-Roe presented the Skeeter, a small helicopter of 2100 lb total weight, carrying a crew of two. It is powered by a Gipsy Major 145 hp engine. Variations of this have been developed for military use. Operating under Sikorsky license, Westland presented the S-55 and the S-51, both now equipped with an Alvis engine in place of the original Pratt & Whitney.

LOOK TO THE LEADER...
FOR LUBRICATING DEVICES

GITS



40 YEARS' LEADERSHIP

Yes, for 40 years GITS has been setting the standard for industry . . . solving tough lubricating problems . . . earning the confidence of manufacturers . . . it's the reason people say, "Call GITS first".



LOW COST

Yes, GITS oil cups can do a complete lubricating job for you . . . prolonging bearing life, reducing maintenance costs, cutting down-time, boosting production . . . and GITS oil cups cost so little.

WORLD'S LARGEST SELECTION

Yes, only GITS can offer you such a wide range of standard stock sizes. From *just one* source you can get *all* lubrication devices in *any design* for *any purpose*.



CONSISTENT TOP QUALITY

Yes, GITS is known for uniform quality in design, materials and machining . . . this means constant, dependable performance for you. Inferior products can cost you time and money. Demand the best . . . get GITS.



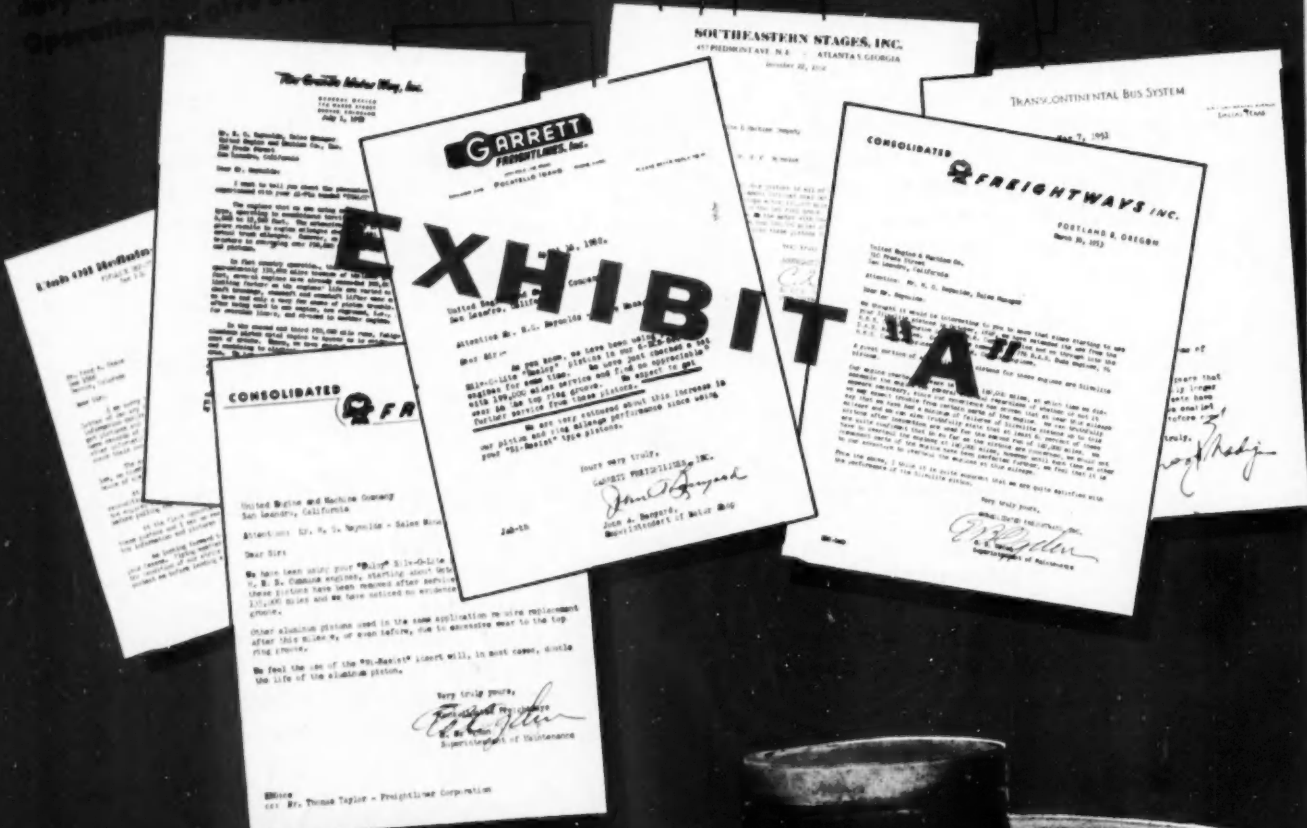
Oil Hole Covers • Oil Cups • Grease Cups • Bottle Oilers • Gauges • Gravity-Feed • Wick-Feed
Constant Level • Vibrating Rod Styles • Threaded or Drive-Type • Elbow or Straight

GITS **BROS. MFG. CO.**
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Write today for Free Catalog No. 60A. Use it as your handy reference for lubricating devices.

MORE DUALOY EVIDENCE

HUNDREDS of dualoy pistons operating in thousands of heavy duty trucks, tractors and buses... **PROVEN PERFORMANCE**



UNITED ENGINE AND MACHINE COMPANY
310 PRED A STREET • SAN LEANDRO, CALIFORNIA

THE VERDICT

DUALOY



THE BEREA BUS LINE CO.

BEREA, OHIO

April 15, 1953.

Mr. H. G. Reynolds
United Engine & Machine Co.
San Leandro, California.

Dear Mr. Reynolds:

The Berea Bus Line Co. operates 26 buses, covering approximately 750,000 miles a year. Using standard production pistons, a mileage range of 25,000 to 60,000 found the top rings broken, the top ring groove worn, and the cylinders scored, necessitating a rebore and new pistons.

In July of 1950, we installed our first set of your Dualoy pistons in a 12 cylinder Model 24 A White engine. In December of 1952, we removed these pistons for inspection at 148,522 miles. We found no top rings broken, the pistons in perfect condition, and a maximum of .0025 inches cylinder wear. We reinstalled the pistons with new rings.

After examining these pistons, rings, and cylinders, there is no doubt in our minds that the rings could have been run for many more miles before there would have been any worn rings or ring fatigue. We are very well satisfied with this mileage to a minor overhaul and we feel we will get at least another 100,000 miles out of this set of pistons, bringing this engine up to 250,000 miles before a major over-haul.

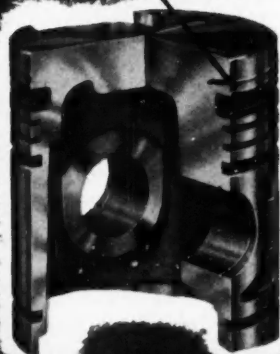
On the 280TA-6 cylinder engines, we were having the same difficulty---breaking the top ring (pistons looked like termites worked on them) and scored cylinders. We then installed the Dualoy Pistons and have not broken any top rings and have found less than .004 wear at 60,000 to 70,000 miles of service..... pistons, rings, and cylinders in perfect condition.

We have been using the Dualoy Pistons in our motor rebuilding since early 1951 and have not had any piston or piston-ring failures. These engines are still running very satisfactory with 3 to 5 times as many miles over the regular standard production pistons.

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FOR TRUCKS, TRACTORS, BUSES

UNITED ENGINE AND MACHINE COMPANY

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RUSSIA'S STRENGTH TODAY

(Continued from page 66)

The artificialities of the system and the hazards to Russia's food supply and to its political stability are obvious.

Construction Programs

Before World War II, industrial construction was one of the weakest areas in the Soviet economy, marked by heavy reliance upon foreign techni-

cal aid, by dispersed efforts and lack of coordination, and by primitive methods substituting enormous manpower for machines. During the war, a number of preparatory steps were taken toward a more rational approach. Most notable was the analysis of typical space-relationships and plans published in Vol. 14 of Mashinostroyeniye. Entsiklopedicheskii

Spravochnik (Mashgiz, Moscow, 1946). In 1947, industrial construction, formerly a subsidiary function of each industrial ministry, was assigned to special construction ministries. A program of rapidly expanding the output and variety of construction machinery began.

Within the last three years, a new systematic approach, involving administration design and construction methods has been evolved. At the present time, the highest organ charged with coordinating construction plans, designs and operations is the State Committee for Construction Affairs (Gostroi), a body directly under the Council of Ministers of the U.S.S.R. and coordinate in status with the State Planning Commission (Gosplan). It assigns responsibility for the design of given types of installations throughout the Soviet economy. For example, the design organization of the Ministry of Electric Power Stations and Electrical Industry has prime responsibility for all power stations, air-pumping installations, and boilers; the Ministry of Petroleum Industry, for all inter-shop pipelines. A second function of Gostroi is to set up and coordinate programs of type-designs to be used with suitable modifications in repetitive kinds of construction. The "Joint Plan of Type-Designing by Ministries, Offices and Union Republics for 1953" comprises 642 type-designs, including 503 industrial, 70 in housing, and 69 in utilities and cultural facilities. Finally, Gostroi enforces rigorous economy and maximum capacity use in construction plans. It strongly stresses multiple-story apartments over small dwellings because the former are more economical in construction (less piping, wiring, etc., per housing unit) and in operation (especially for heating). To this end it reviews building plans and even revises general standards.

The new norms, as published in Stroitel'stov 1953, No. 3, pp. 37-39 normalize machine-tool spacing intervals below the minimum requirements established in 1946 (Mashinostroyeniye. Entsiklopedicheskii Spravochnik 14:204-206, 352): the new spacing range from 400 to 900 mm, compared to 500 to 1000 in the old minima. Plant areas per producing machine-tool have been reduced as follows: for Class I (light) shops, from 20-27 sq m to 18-21 sq m; for Classes II and III (medium and heavy) shops, from 18-41 sq m to 19-22 sq m; for Class IV (very heavy), from 25-37 sq m to 21-24 sq m. The

(Turn to page 129, please)

How the FORD MOTOR COMPANY

Tests Engines before installation



the problem

To run Ford engines under their own power before installation.

the answer

A bank of Nankervis Engine Test Stands—Model HET-8000. These test stands thoroughly flush the engines with oil to remove any foreign residue. Necessary adjustments—timing, tappets, carburetion—are made as the engine is operating.



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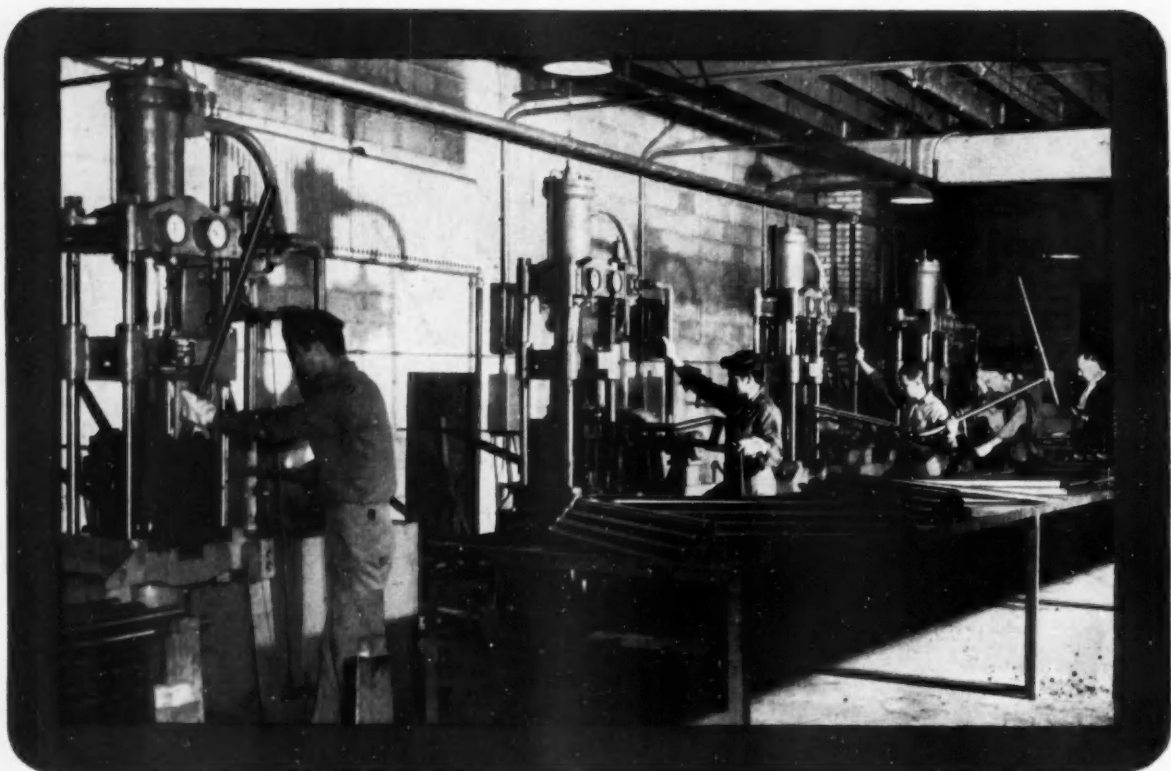
Everyone is finding Precision "O" Rings the best answer to many sealing problems—and they are finding, too, that Precision leads the field in engineering help and proper deliveries to keep production lines going. Let us help you. Send for our "O" Ring Handbook and let us have your inquiries.

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another job done better, faster
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Four 20-ton hydraulic tube benders—one of many types of Elmes Presses built for special metalworking jobs—are shown above in operation at James Steel and Tube Co., Hazel Park, Michigan. Automobile tailpipes, each requiring seven bends, are produced at the rate of 2000 complete units per eight-hour shift.

These small but heavy-duty, high production Elmes Presses are designed especially for bending tubing into automotive exhaust and tailpipes. Their performance has been so outstanding—affording substantial savings

in time, effort, maintenance and money—that they are now widely recognized as the logical "first choice" among presses used for this application.

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RUSSIA'S STRENGTH TODAY

(Continued from page 126)

realism of the new norms is not fully certain.

The present trend in Soviet construction involves not only standardization but also prefabrication and "industrialized" building methods. Illustrative of current Soviet practice are Kartashov's proposals for the standardized construction of heavy industrial buildings. This involves the use of reinforced concrete pillars made of two sections bolted together, the massive lower ones supporting girders, craneways, and other heavy elements; the lighter upper ones carrying only the wall-locking beams, roof girders, and roofing. The roof structure consists of prefabricated, 18-meter span (EK-2) girders; where longer spans are needed the girder units are welded together and reinforced with additional members. Concrete slab roofing and suitable skylights are laid down upon the girders. The walls have independent foundations abutting the pillars, and are self-supporting. They consist of prefabricated, interlocking, concrete or glass blocks locked at the top to the pillars by horizontal steel beams and clamps.

To make this type of construction possible, the extensive use of prefabrication in special shops at the construction site or in factories is needed. Two such factories are just being completed in Moscow Oblast'. Identical in design, each has an annual capacity of 120,000 cu m of pre-fabricated concrete elements up to five tons in weight, adequate for 700,000 sq m of living space (housing construction in Moscow in 1952 totalled 782,000 sq m). With 690 workmen, each is to operate four conveyor lines: 4.0 by 6.4 meter roof panels of concrete reinforced with steel wire (35 mm minimum thickness, with deep corrugations on the upper surface); rafters and stairs; pillars; narrow wall panels, and stair heads; and wide, exterior wall panels.

Another essential is heavy hoisting equipment. That developed by the Soviets consists of demountable steel tower-cranes of various capacities from 1.6 to 5.0 mt.

Much else in current Soviet building practice is conventional. Some special features deserve mention. Great stress is being placed upon large re-usable steel containers for bricks, concrete blocks, etc., which can be



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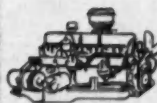
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FOR VITAL ASSEMBLIES



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packed at the factory, then hoisted as a unit from freight car to truck, and from truck to work place, saving intermediate handling. Another problem receiving considerable attention is that of construction under severe winter conditions. Recent developments in this field include the addition of chlorides (NaCl, CaCl₂) to permit the hardening of plastic and concrete in freezing weather. In the Urals, Olesov et al have designed equipment for the induction heating of steel to 150 C, which permits reportedly satisfactory welding down to -35 to -45C.

In all, the recent Soviet develop-

ments in industrial construction are of the greatest potential importance, not only for the civilian economy but also for military purposes such as air-base construction. Nevertheless, caution is needed in assessing the current role of these changes. First, not more than a fraction of the total construction in the Soviet Union is as yet being handled by large-scale, carefully planned methods. For example, a Soviet survey of 1952 showed that, out of 1080 urban building organizations, 38 per cent had an annual volume of construction under 3.5 million rubles (say, under 100 workmen) and another 24 per cent, under 7 mil-

lion rubles. Second, while exceptional results have been claimed in a number of cases, such as the expansion of the steel mill at Zaporozhye, even the large undertakings are encountering many difficulties (which will be detailed in the next section) and the program as a whole is explicitly behind plan. Finally, many of the new designs, such as Kartashov's proposals, have questionable features (e. g. in regard to resistance to settling, earthquakes and blast) and may require extensive alterations before satisfactory results can be achieved.

Part II of Russia's Strength Today will appear in an early issue of AUTOMOTIVE INDUSTRIES.



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KLEM  *Chemicals Inc.*
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ENGINE BALANCING

(Continued from page 72)

the correct length of strip has been prepared, a punch shears it off and the balance strip is gripped by a set of fingers which carry it to jaws over the lower electrode of a Progressive welder attachment. The fingers then release the strip and rise out of the way to enable the welding head to rotate into welding position.

Upon completion of balance drilling, a green light goes on to tell the operator when the welding head is ready to proceed. The crankshaft assembly is then rotated to the angle corresponding with the unbalance position of the torque converter and the operator presses the weld button to initiate the welding operation.

After the corrections have been completed, the operator restarts the machine to make sure that final balance now is within the standard tolerance limits. It is significant that the operation also serves as a positive check on engine friction. The machine is so arranged that it will apply only a limited amount of torque at the established speed of 400 rpm. If engine friction exceeds this value the machine will be stopped automatically to permit inspection of the engine.

In substance, then, this is the first example of engine balance automation to be found in the industry at this writing.

Consider now a brief description of the operations on the adapter plate and torque converter housing.

(Turn to page 138, please)

For HYDRAULIC presses, too...
it pays to specify BLISS

New BLISS

HYDRO-DYNAMIC PRESS

helps Ford form 1000 different wing parts

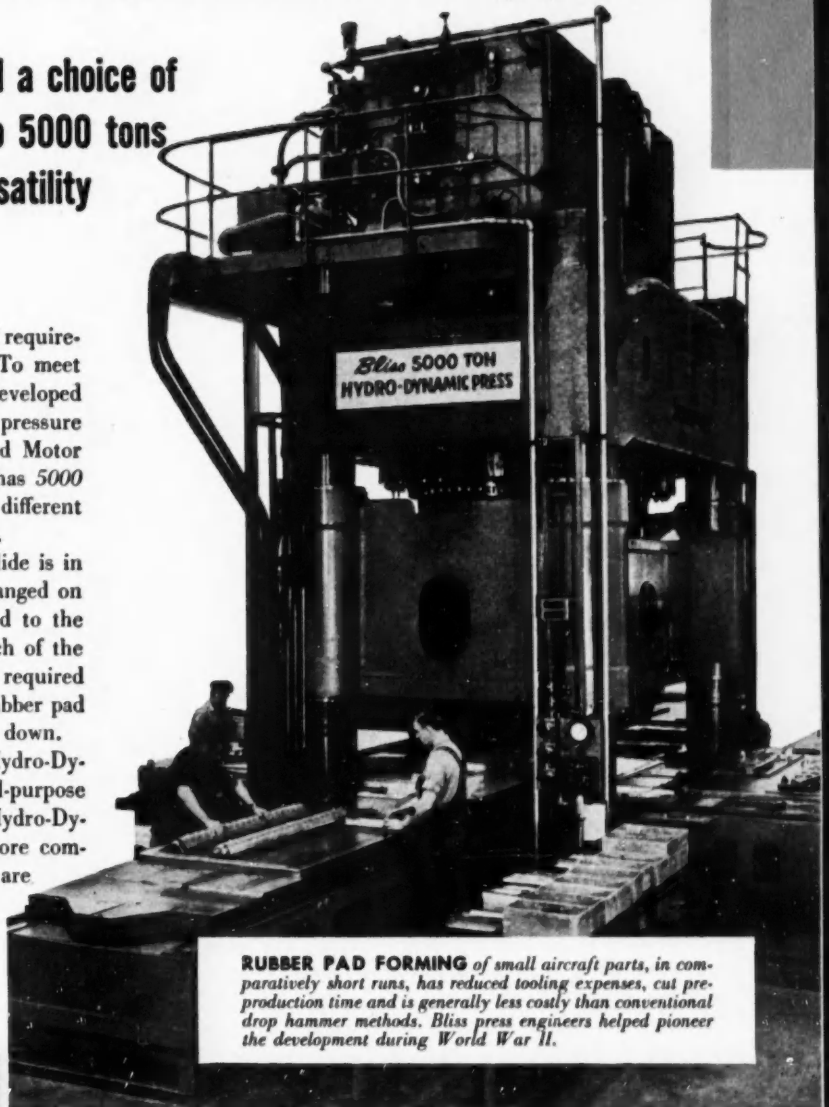
Four die slides and a choice of
any pressure up to 5000 tons
give short run versatility

High pressures and short runs are typical requirements of modern aircraft production. To meet these needs during World War II, Bliss developed special rubber pad forming presses. Now pressure requirements are higher still. The Ford Motor Company's new Hydro-Dynamic press has 5000 tons capacity. And it produces over 1000 different wing parts at Ford's Kansas City plant.

Here's how it works: While one die slide is in the press, blanks are set up or dies changed on the other three. Slides can then be fed to the press in any sequence; operators at each of the die slide tables can select any pressure required up to 5000 tons; and, of course, the rubber pad forming techniques keep tooling costs down.

Like this Ford installation, many Hydro-Dynamic presses are engineered for special-purpose use. But also available are standard Hydro-Dynamic presses designed to meet the more common production problems. Both types are described in Catalog 30-A which is yours for the asking.

Simply write or wire address below.



RUBBER PAD FORMING of small aircraft parts, in comparatively short runs, has reduced tooling expenses, cut pre-production time and is generally less costly than conventional drop hammer methods. Bliss press engineers helped pioneer the development during World War II.

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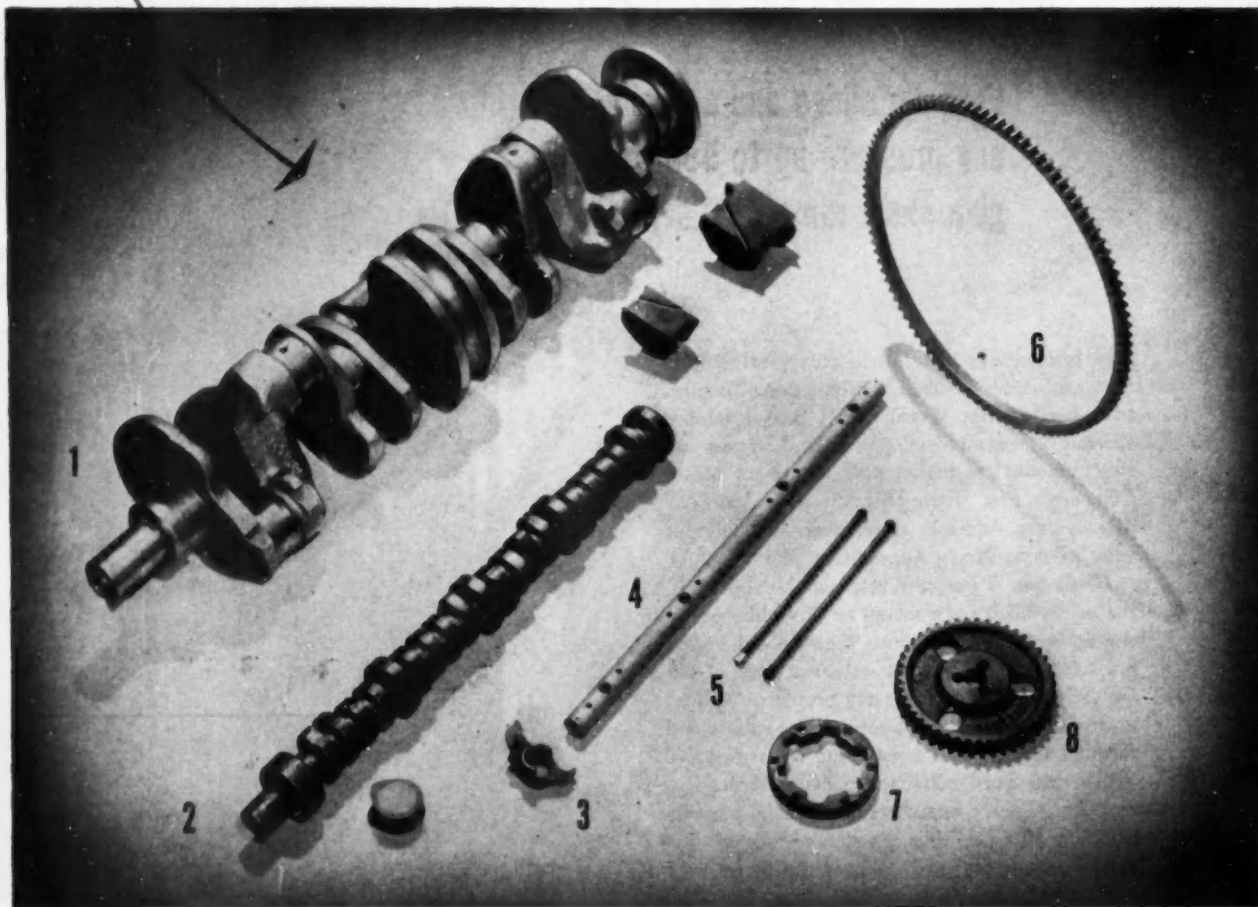
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what we hardened and how we did it

- | | |
|---------------------|--------------------------|
| 1. Crankshaft | 5. Push rod |
| 2. Camshaft | 6. Starter ring gear |
| 3. Rocker arm | 7. Overriding clutch cam |
| 4. Rocker arm shaft | 8. Timing gear |

Here's a quick "road show" of Flamatic selective surface hardening applications to automotive parts, demonstrating the wide range of shapes and sizes Flamatic can handle on a high production basis. Operation photos show how flexible tooling makes the basic Flamatic machine extremely productive.



These applications illustrate the three basic Flamatic principles—concentrate heat, control temperature, and confine hardness—which result in exceptional uniformity of results.

While the machines illustrated involve special modifications or tooling for long runs at high production, standard Flamatics permit economical handling of short runs when parts can be handled with relatively simple tooling or work-holding fixtures.

The Cincinnati Flamatic Heat Engineering Laboratory is at your service to analyze your needs, test-run your parts, and make recommendations. Write for Publication No. M-1724.

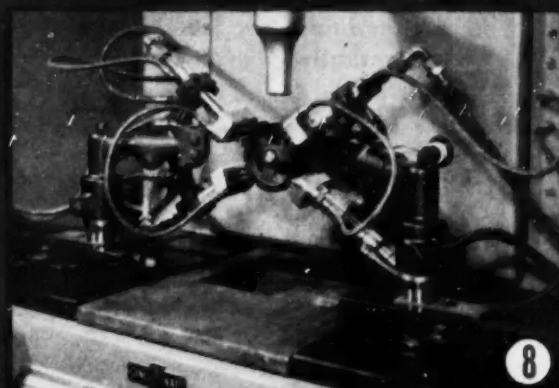
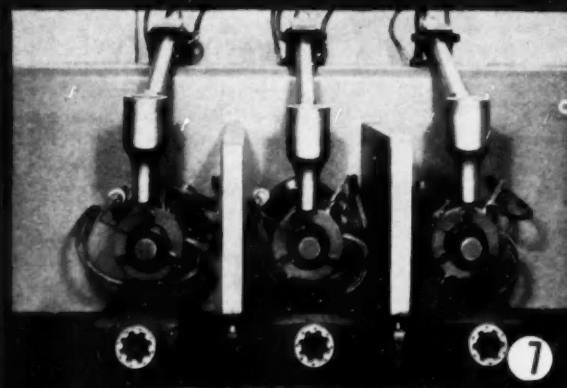
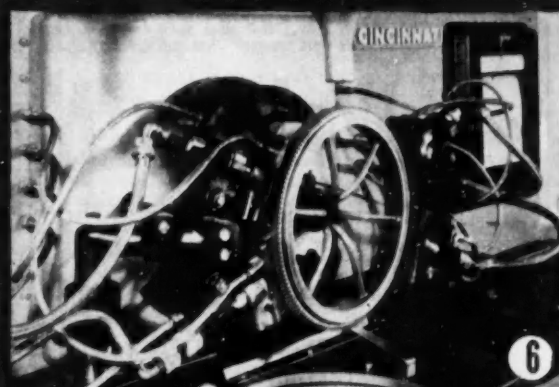
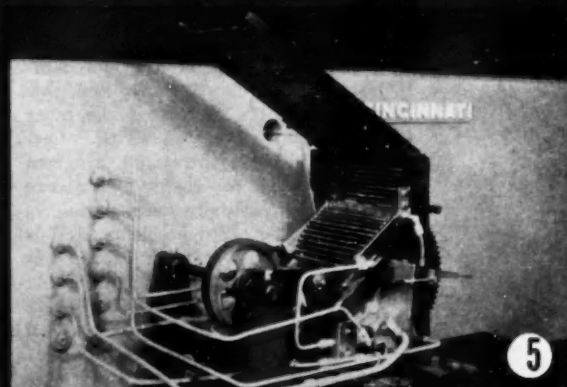
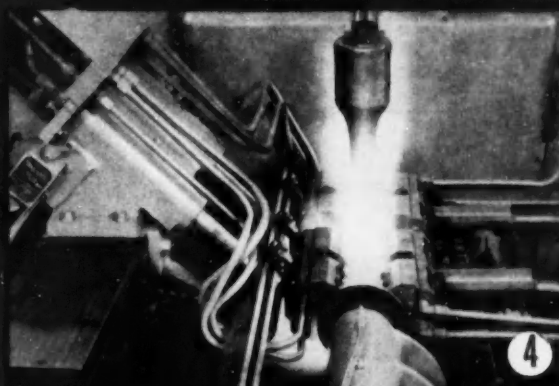
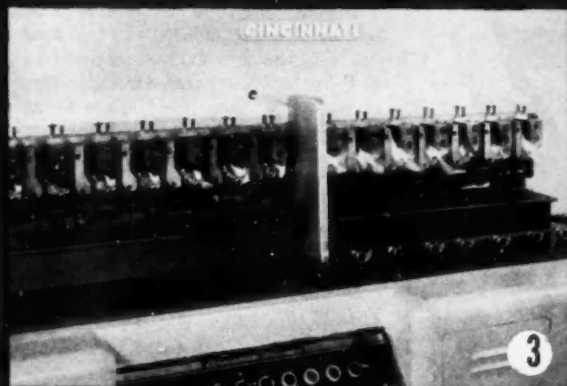
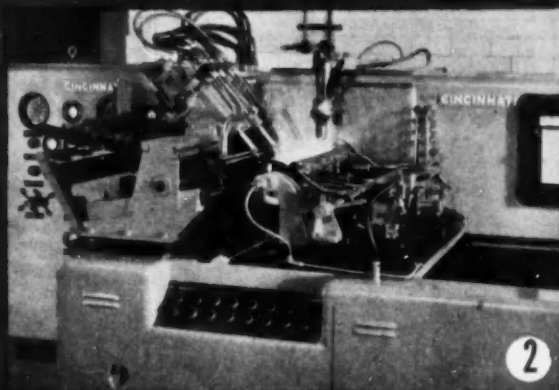
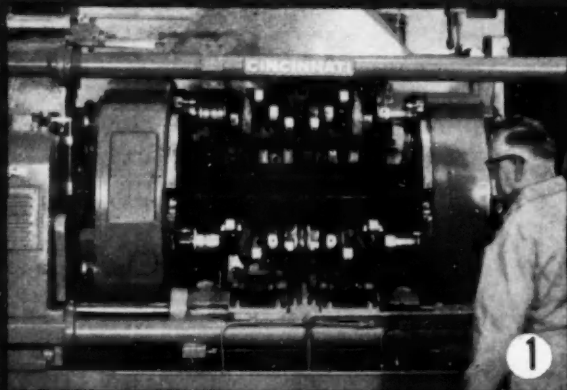
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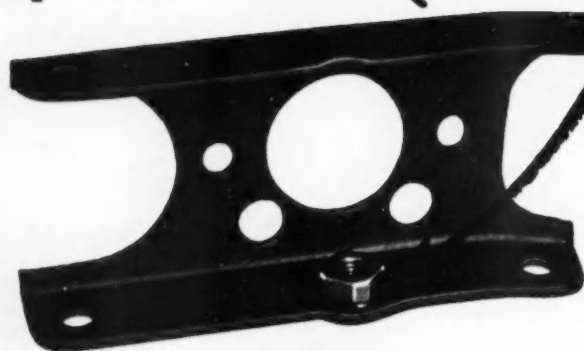


These machines are used for the production of various types of machinery and equipment.

These machines are used for the production of various types of machinery and equipment.

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**USE
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Midland Welding Nuts anchored* to parts in inaccessible places eliminate the need for holding them while attaching other parts.

***THIS IS ALL YOU DO**—Just insert collar of Midland Welding Nut in hole for bolt or screw, resistance weld the Nut in place, and the Nut is there for the life of the job. Nuts can be automatically fed to the welder. Speed your production . . . save money,



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DOOR CONTROLS**

**HYDRA-MATIC
FIRE**

(Continued from page 58)

garage. The power house, located remotely from the plant, also escaped damage. These buildings, together with the several thousand footings supporting the structure, remain as the nucleus of later rebuilding.

While no official estimates have been available, reliable news sources have said that the damage is around \$70,000,000, about \$31,500,000 being covered by insurance.

Let us turn now to Willow Run. GM has leased 1,500,000 sq ft of floor space in the area earlier set aside by K-F for building cargo aircraft. This is about the same floor space as at Livonia and doubtless will be set up in about the same way with the same number of machines, tools and equipment. Some of these may not be of the same type or make since GM was engaged in buying new or used machines wherever available, preempting some new machines that were to be delivered to other GM Divisions in an effort to replace those junked.

Willow Run will set up for producing the same types of Hydramatics as were in production at Livonia and, as mentioned earlier, it is hoped that production volume will be sufficient to carry the 1954 model program. At some point Riopelle doubtless will be closed down and this would be most likely to occur after Willow Run is in full swing. Certainly the sub-contracting program will be much too costly to continue longer than actually necessary.

One of the allied problems at Willow Run is the transfer of workers from Livonia without disrupting the present setup of Local 735, UAW-CIO and without change in local union leadership. Since this was imperative in the light of the emergency, contract negotiations were conducted with International headquarters while the move was being made.

From the standpoint of public interest there remains the matter of long range planning for Livonia. At the present writing it seems only a matter of course that GM will rebuild. But it takes many months to erect a large plant and it requires anywhere from six months to a year or more to acquire new machinery. Consequently, it is difficult for an outsider to judge how long it would be before Livonia is reborn. It is

(Turn to page 138, please)

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Milsko offers you today's finest in truck-seat engineering . . . the "Monarch" . . . with balanced body support and full cushion contour back rest. Improved suspension of cushioning materials provides a relaxed ride . . . maximum comfort with 2-way buoyancy to absorb road shocks. Strong tubular steel frame for heavy duty service; with or without fore and aft adjustment. Add the plus-value of a Milsko "Monarch" to your truck for enduring customer satisfaction. Our engineering department will gladly cooperate with you.

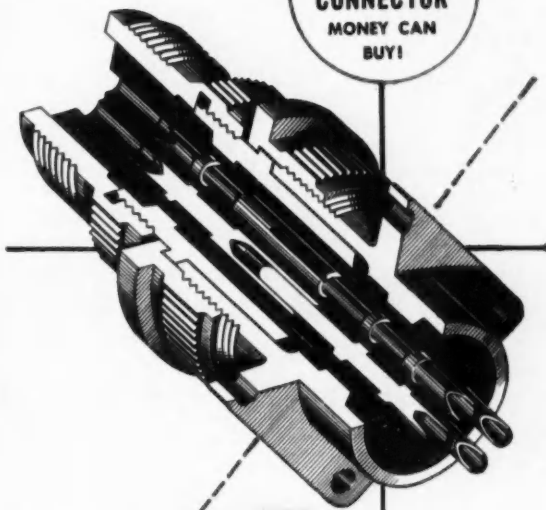
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OF COMING SHOWS AND MEETINGS

Paris Salon, FranceOct. 1-11
 National Fluid Power Association,
 first Fall meeting, Sheraton
 Hotel, Chicago, Ill.Oct. 6-7
 Ninth Annual National Conference
 on Industrial Hydraulics, Ill. In-
 stitute of Technology and Ar-
 mour Research Foundation,
 Hotel Sheraton, Chicago, Ill.Oct. 8-9

Elighth Midwest Quality Control
 Conference, Masonic Temple,
 Davenport, Ia.Oct. 8-9
 First International Engineers' Con-
 ference, Rome, ItalyOct. 8-11
 National Defense Transportation
 Association, Eighth Annual Con-
 vention, Brown Hotel, Louis-
 ville, Ky.Oct. 11-13
 Automobile Old Timers' 14th Annual
 Meeting, Hotel Astor, New York,
 N. Y.Oct. 14
 Sixth annual conference on machine
 tools, American Institute of
 Electrical Engineers, Cleveland
 Hotel, Cleveland, O.Oct. 14-16
 Society of Industrial Packaging and
 Materials Handling Engineers,
 annual meeting and exposition,
 Boston, Mass.Oct. 19-22

35th National Metal Congress and
 Exposition, Cleveland, O.Oct. 17-23
 41st National Safety Congress and
 Exposition, Chicago, Ill.Oct. 19-23
 38th International Motor Show,
 Earls Court, LondonOct. 21-31
 American Gear Manufacturers As-
 sociation Semi-Annual Meeting,
 Edgewater Beach Hotel, Chi-
 cago, Ill.Oct. 25-28
 Manufacturing Conference, Ameri-
 can Management Association,
 Bellevue-Stratford Hotel, Phila-
 delphia, Pa.Oct. 28-30
 American Society of Body Engi-
 neers, 7th annual technical con-
 vention, Rockham Bldg., De-
 troit, Mich.Oct. 28-30
 SAE International Production Meet-
 ing, Royal York Hotel, Toronto,
 Canada.Oct. 29-30
 American Society of Tool Engineers,
 semi-annual membership and
 board meeting, Dayton Blitmore
 Hotel, Dayton, O.Oct. 30-31
 SAE National Transportation Meet-
 ing, Conrad Hilton Hotel, Chi-
 cago, Ill.Nov. 2-4
 SAE National Diesel Engine Meet-
 ing, Conrad Hilton Hotel, Chi-
 cago, Ill.Nov. 3-4
 Vickers' Third Transport Aircraft
 Hydraulic Conference, Park
 Shelton, Detroit, Mich.Nov. 3-4
 SAE National Fuels and Lubri-
 cants Meeting, Conrad Hilton
 Hotel Chicago, Ill.Nov. 4-6
 17th Annual Time and Motion Study
 and Management Clinic, Indus-
 trial Management Society,
 Sheraton Hotel, Chicago, Ill.Nov. 4-6
 Refrigeration and Air Conditioning
 Exposition, Public Auditorium,
 Cleveland, O.Nov. 9-12
 American Petroleum Institute Meet-
 ing, Hilton Hotel, Chicago, Ill.
 Nov. 9-12
 Montreal Materials Handling, Tool
 and Industrial Equipment
 Shows, Show Mart, Montreal,
 Que.Nov. 9-13
 Association of American Battery
 Manufacturers, Fall Meeting,
 Edgewater Beach Hotel, Chi-
 cago, Ill.Nov. 16-19
 Fourth Pan American Road Race,
 MexicoNov. 19-23
 American Society of Mechanical En-
 gineers, annual meeting, Statler
 Hotel, New York, N. Y.
 Nov. 23-Dec. 4
 American Society of Agricultural
 Engineers, winter meeting,
 Edgewater Beach Hotel, Chi-
 cago, Ill.Dec. 7-9



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Put the Burden on
 Burt Basco

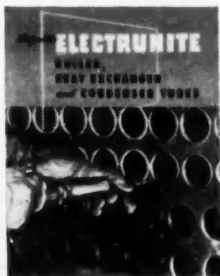
Burton **AUTO SPRING CORP.**
 48th ST. at WESTERN AVE.
 Chicago 32, Illinois

1954

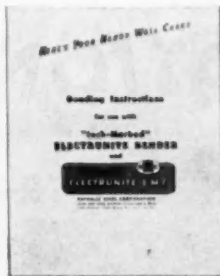
SAE Annual Meeting, Sheraton-
 Cadillac Hotel and Hotel Statler,
 Detroit, Mich.Jan. 11-15
 National Motor Boat Show, Bronx,
 N. Y.Jan. 16-23
 Society of Plastic Engineers, 10th
 annual technical conference,
 Royal York Hotel, Toronto,
 Ont.Jan. 27-29
 National Transport Vehicle Show
 and Fleet Maintenance Exposi-
 tion, New York, N. Y.Feb. 17-19
 SAE National Passenger Car, Body,
 and Materials Meeting, Hotel
 Statler, Detroit, Mich.March 2-4



1. Here are all the facts on ELECTRUNIT E.M.T. Includes bending tools and accessories; dimensions and weights of tubing and elbows; facts on "Dekoron-Coated" E.M.T.



2. How to specify boiler, heat exchanger and condenser tubes is only one information-packed section of this 20-page booklet. Also includes allowable working pressures.



3. Handy wall chart with bending instructions for use with "Inch-Marked" ELECTRUNIT E.M.T. Diagrams are large, easy to read, easy to follow. For quick reference.



4. Product designers interested in mechanical and pressure tubing will find a lot of facts in this brochure. Pictured are many examples of products where costs were trimmed.



5. Sizes, dimensions and weights of ELECTRUNIT mechanical tubing, pressure tubing and electrical metallic tubing are included in this 8-page booklet. Also fabricating.

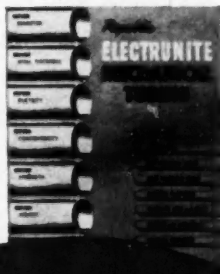
6. This handy chart puts size, gage ranges at your fingertips. Easy to carry in your pocket. Covers mechanical pressure and stainless tubing, along with stainless steel pipe.

7. Lots of help for design engineers in this 8-page brochure on Mechanical Tubing. Includes advantages; applications; size tolerance tables; gage tolerance tables.

8. Most of what you need to know about Stainless Steel Tubing and Pipe can be found in this 28-page booklet. Data on fabricating and finishing, how to lay out drawings.

9. Carbon and stainless tubing for the process industries are described in this booklet. Valuable laboratory corrosion data along with properties of Endure Stainless Steel Tubing.

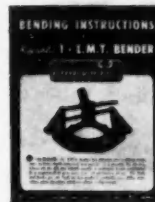
10. Product designers balked by the high cost of unusual tubular shapes will be interested in this booklet on the Dewey Process for configured tubing. Process is shown in pictures.



Here's Your FREE LIBRARY On Mechanical Tubing, Pressure Tubing, Stainless Steel Tubing And Pipe, And Electrical Raceways



11. When journeymen want instructions on how to bend ELECTRUNIT E.M.T. all you do is hand them this booklet of bending instructions. Pocket size.



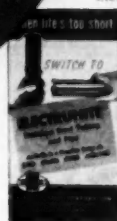
12. Pictures and captions tell the story of how to use the Republic ELECTRUNIT E.M.T. 1-1/4" bender.



13. Some ideas on where to use tubing profitably are contained in this handy reference folder. Also contains size ranges.



14. Advantages of using "Dekoron-Coated" ELECTRUNIT E.M.T. are explained in this compact folder. Shows how easy it is to install this polyethylene coated raceway in corrosive atmospheres.



15. Eight analyses of stainless steel tubing, pipe and general uses.



16. Outstanding features of ELECTRUNIT E.M.T. are briefly described.



17. Complete engineering data on "Dekoron-Coated" ELECTRUNIT E.M.T.



18. Advantage using ELECTRUNIT boiler, heat exchanger or condenser tubes.



ELECTRUNITE TUBING

CLIP COUPON AND MAIL TO:

REPUBLIC STEEL CORPORATION, Steel and Tubes Division
East 131st Street, Cleveland 8, Ohio

Name _____ Position _____

Company _____

Address _____

City _____ Zone _____ State _____

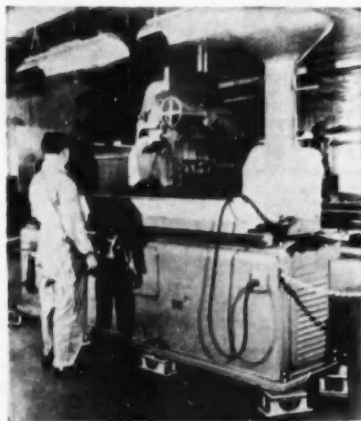
Please send me the following literature (circle numbers desired)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

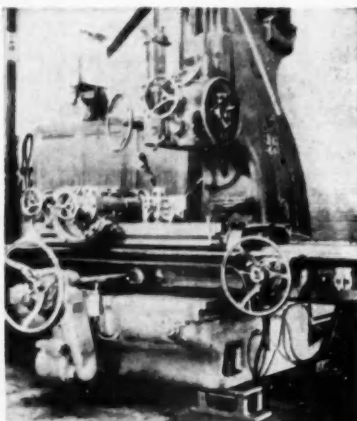
STOP VIBRATION

WITH

KORFUND VIBRATION CONTROL



This Thompson 12" x 60" Surface Grinder is installed at Firth Sterling, Inc., Pittsburgh, Pa. Vibration from grinders affected precision testing equipment on floor below; vibration and noise was also extremely annoying in executive, sales and laboratory offices. Korfund Isolators directly under the grinders, completely solved the problem. Korfund Units stop vibration and insure quieter machine operation.



This Pratt & Whitney #38 Jig Borer is installed at Caterpillar Tractor Co., Peoria, Illinois. Korfund Vibration Isolators protect this precision machine against severe external vibration from trucks and trains which had made accurate work impossible. Isolators are set in pockets made by removing wood block flooring. Korfund Units stop vibration and reduce rejects—improve work quality.



This is one of the Heald #49 Bore-Matics installed at Thompson Products Co., Cleveland, Ohio. Shock transmitted from one automatic boring machine to another caused intermittent skips and gauges. One machine had to be kept idle until both were mounted on Korfund Isolators. Now they operate together and turn out perfect work. Korfund Units stop vibration and increase production.

Korfund Vibration Control also: permits more efficient plant layouts, decreases original building and foundation costs, permits installations without reinforcement of floors, reduces machine maintenance costs, and lengthens machine life.

Standard Korfund Isolators are available for most applications. A Selector Chart giving recommendations for both normal and critical conditions is available. See Sweet's Catalog Files or write us for Bulletin No. 5.

For specific recommendations, contact us or your local Korfund office. A half century of experience is at your disposal.



THE KORFUND CO., INC.



48-02A Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

HYDRA-MATIC FIRE

(Continued from page 134)

only natural to assume that in the interim, and that would extend well into the end of 1954, Willow Run will be the center of H-M production.

If the writer may speculate on the basis of facts known around Detroit, there is another angle on the possible future course at Livonia. It is generally known that GM has been experimenting with other types of automatic drives to replace Hydra-Matic. For example, just before Korea, it was known that Cadillac had been planning to shift to a torque converter with special gearing.

Putting everything together it seems natural to assume that now is an opportune time to consider a successor, or successors, to Hydra-Matic. As a matter of fact, it seems hardly in the cards that GM would rebuild and retool a new Livonia exactly the way it was before the fire. It would appear much more logical and more economical to plan it for entirely new products, although some of the Willow Run facilities would have to be salvaged to provide manufacturing for service. In any event, these speculations are the writer's and not opinions gathered from official sources.

ENGINE BALANCING

(Continued from page 130)

First operation on the adapter plate is the finish-grinding of both sides, simultaneously, in a Gardner No. 125—30-in. double-spindle horizontal grinder. As illustrated, the work is loaded into a special fixture or keeper where it is free to move, i.e., it is not firmly clamped. The fixture is rotated slowly by means of an independently-driven double-Vee-belt. The two grinding wheels are driven in opposite directions of rotation. The net effect is to produce finely finished surfaces on both faces while parallelism is held to a tolerance of 0.001 in.

The second operation on the adapter is done in the special Michigan Drill Head four-station trunnion type machine. Work is loaded at the first station. The right hand head at Station 2 drills 14 holes, while the left hand head drills nine holes. The right hand head at Station 3 reams four holes; while the

(Turn to page 142, please)

YOU CAN'T BEAT GARRETT



FLAT WASHERS

Garrett gives you fast delivery on the largest line of flat washers available anywhere. Precision-made to the most exacting civilian or Armed Forces specifications. Here are just a few of the many Garrett flat washers available:

Washers to SAE, USS and ASA dimensions:

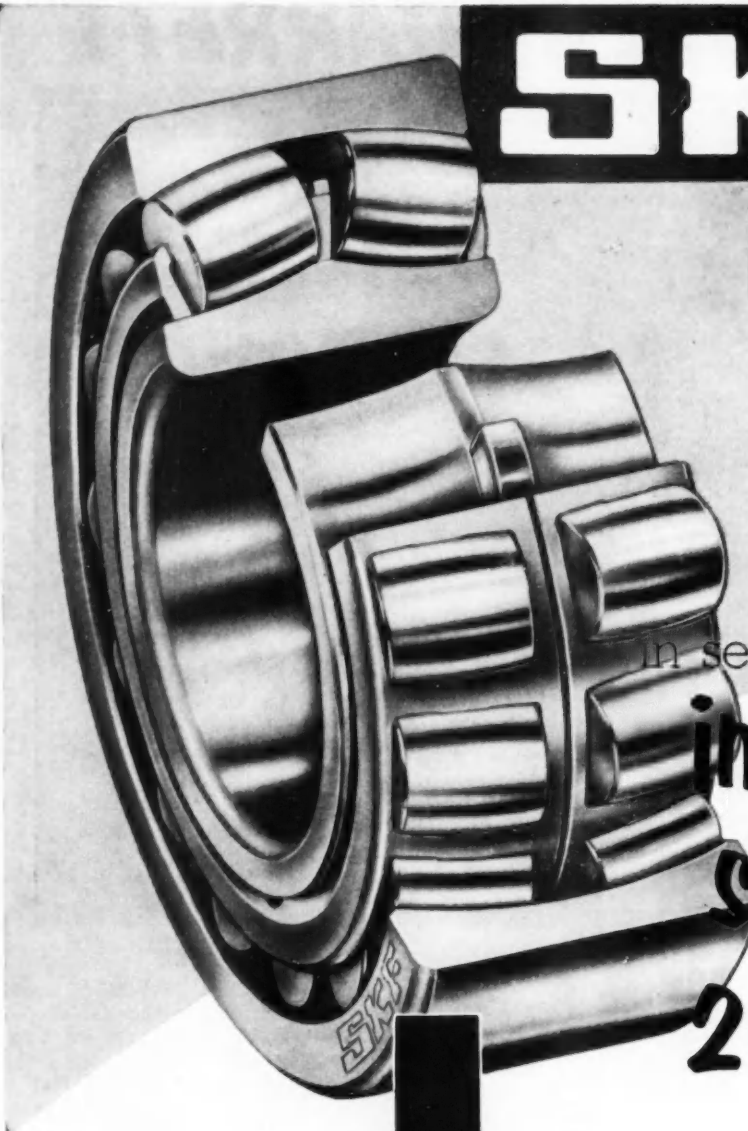
| | | |
|--------|--------|--------------|
| AN 945 | AN 961 | NAS 143 |
| AN 955 | AN 970 | BEB X Series |
| AN 960 | AN 975 | BEC X Series |

ALL READY FOR PROMPT DELIVERY



GEORGE K. GARRETT COMPANY, INC.

PHILA. 34, PA.



SKF

Increases

this improvement
in series 222 and 223

increases the
service life
2 to 3½ times

*other advantages
are important*

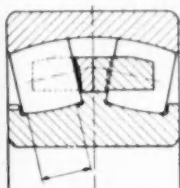
ECONOMY: When designing new equipment, the desired life can be obtained by using smaller or lighter bearings at considerable cost saving.

COMBINED LOADS: This great forward step in bearing design provides a Spherical Roller Bearing capable of carrying heavier combinations of radial and thrust loads or pure thrust loads of greater magnitude.

SELF-ALIGNMENT: The important self-aligning feature of **SKF** Spherical Roller Bearings has been preserved, so that considerable misalignment between the shaft and housing has no ill effect whatever on bearing capacity or life.

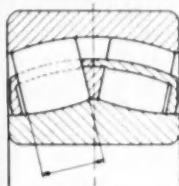
capacity

of spherical roller bearings **25% to 50%**
by means of improved internal design



BEARING 22315

This is the Spherical Roller Bearing design originated by **SKF** more than 30 years ago. The cross-section shows how the integral inner ring flanges, and the undercuts adjacent thereto, limit the effective length of the rollers.



BEARING 22315C

Here is the *latest SKF* improvement, a *revolutionary advance in design*. Effective roller guiding is accomplished by means of a separate ring. This eliminates the need for undercuts! This type of guide ring permits the rollers to take the position which their contact with the rings dictates. This assures uniform load distribution over the entire length of the longer rollers at all times. *Result*—greatly increased capacity and life.

SKF, the originator of the Spherical Roller Bearing, has, here again, provided Industry with another *first* through this improved design. During more than 4 years, thousands of installations have been made in railroad journals, vibrating screens, steel mill machinery and numerous other fields. Performance, in all cases, has been outstanding.

SKF Sales Engineers in our District Offices throughout the country will assist you in making use of the important advantages of the improved internal design of **SKF** Spherical Roller Bearings.

7423 A



This 12-page booklet gives you additional facts—sizes available—added capacity, size by size—increased life you can expect for each size—dimensional tabulations—and load and speed data. Write for your free copy of Bulletin 365-1 now.

SKF INDUSTRIES, INC., Dept. 616,
Philadelphia 32, Pa., manufacturers of
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"Compact bundles of M.E. flats were undamaged when load shifted and wrappings were torn. Other types of boxes would have been severely damaged, and production held up."



"BEST BY TEST" FOR PISTON RINGS!

"Wartime tests showed M.E. boxes delivered our aircraft piston rings in perfect condition to meet rigid government standards. Now we use M.E. for our automotive line, too."

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"With M.E. we produce 25% more boxes in half the time spent assembling folding boxes. Now packaging keeps up with production... we get stronger, better looking boxes, too!"



METAL EDGE—the engineered method—has solved diverse packaging problems in over 100 American industries.

NATIONAL METAL EDGE BOX CO.

PACKAGING • MATERIALS HANDLING • INVENTORY CONTROL

1208 Callowhill Street, Philadelphia 23, Pa.



ENGINE BALANCING

(Continued from page 138)

starter hole bore is rough- and finish-bored with a special Gairing boring tool fitted with cemented-carbide-tipped blades. Seven holes are tapped at the right hand head at Station 4, while three holes are tapped at the left hand head.

The flywheel housing also starts with finish-grinding of both faces simultaneously. This is done in a vertical two-spindle Gardner grinder, provided with some unusual features tailored to assure perfection of finish as well as to hold parallelism of the two faces within a tolerance of 0.001 in.

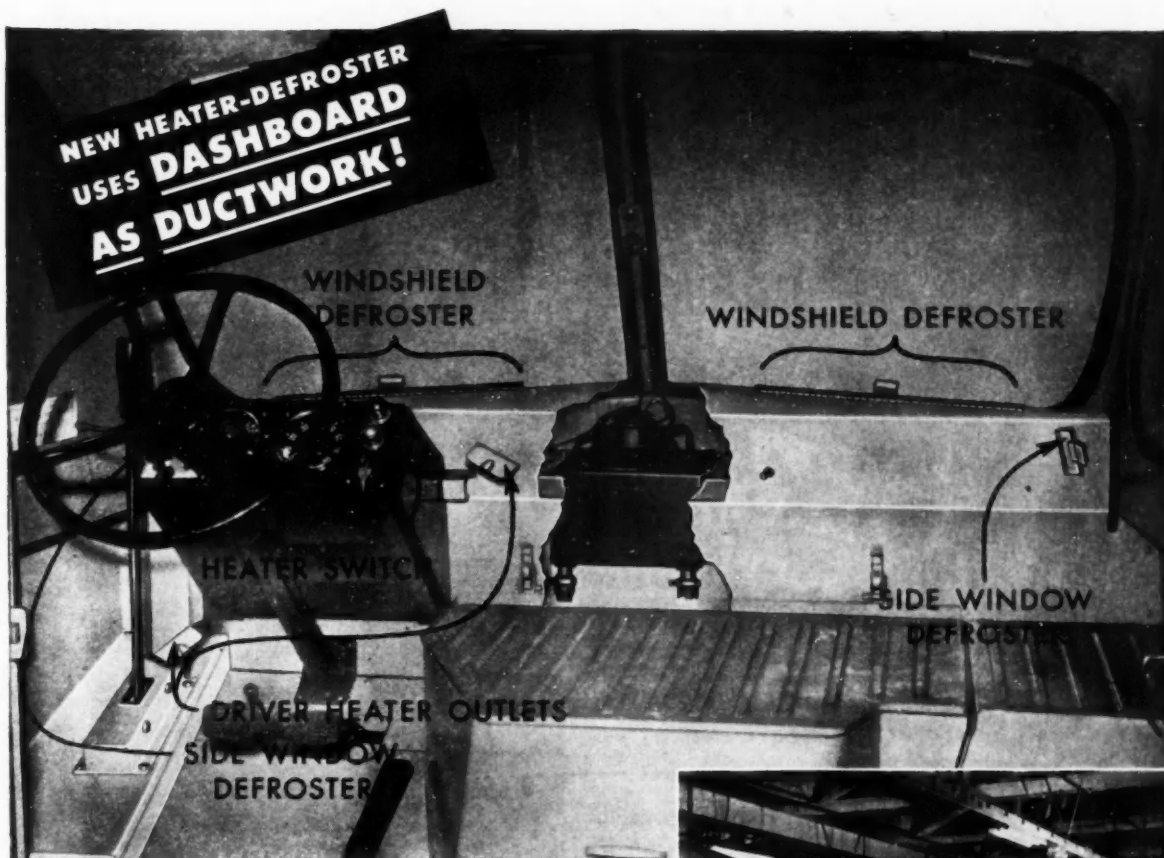
Special provisions have been made in the table mechanism to assure good finish and parallelism. The fixture holds three housings at a time without clamping to permit the work to float freely while held in alignment. In addition, the entire table oscillates fore and aft while in rotation between the grinding wheels. In operation, the lower wheel moves upward as the cycle is started to engage the work with the upper wheel. The table revolves between the two wheels and this engagement also induces the work to rotate slowly within the fixture. The complex of movements of work relative to the wheels aids in producing excellent surface finish.

As in the case of the spacer, the second operation is handled in a special Michigan Drill Head machine, except that in this case the machine is of five-station transfer type. The sequence of operations is as follows:

| Station | Head | Operation |
|---------|-------|--|
| 1 | Load | |
| 2 | Front | Drill and chamfer five holes |
| | Rear | Drill and chamfer six holes |
| 3 | Front | Rough- and finish-bore and chamfer transmission pilot bore |
| | Rear | Ream two dowel holes |
| 4 | Front | Tap five holes |
| | Rear | Tap two holes |
| 5 | Front | Drill two holes |
| | Side | Drill four holes |
| | Rear | Eject work automatically |

With reference to the foregoing it is of interest that the boring operation at Station 3 is performed with a special DeVlieg boring head having a micrometer adjustment for each flycutter. It is fitted with two flycutters for roughing, two for finishing, and one angularly located cutter for chamfering.

Automatic ejection of work at the end of the cycle is effected by having the fixture fold downward, permitting an arm on an air cylinder to reach in and remove the work.



Engineered by **EVANS**

FOR INSTALLATION ON THE TRUCK ASSEMBLY LINE

This remarkable heater-defroster is a fine example of the advantages of Evans custom engineering service. Working hand in hand with the customer's engineering department, our engineers produced a unit radically different in concept that solved a difficult heating and ventilating problem. The Evans organization is staffed to engineer units to specification, organized to build prototypes quickly, equipped to conduct precision tests to latest A.S.H.V.E. procedures. If your needs are for high performance,—ruggedly constructed equipment—it will pay you to consult Evans Products Company, Heating & Ventilating Division, Dept. P-10, Plymouth, Mich.

EVANS

CUSTOM HEATERS

BALANCED HEATING AND VENTILATING SYSTEMS FOR EVERY TRUCK AND BUS



Evans engineering brings you OUTSTANDING ADVANTAGES LIKE THESE

- Heater-Defroster is an integral part of the body construction.
- Unit heats driver position, entire body compartment and windshield area with only 5% variation between rear door and front door.
- Oversize defroster vents, in conjunction with built-in system of ductwork, perform triple service—heating, defrosting, and pressurizing.
- Compact powerful heater delivers 20,000 Btu output at 175 CFM, with only 7 amp. draw on a six volt system.
- Heater unit completely protected—out of sight yet readily accessible for service—on top of engine position permits extremely short water lines.

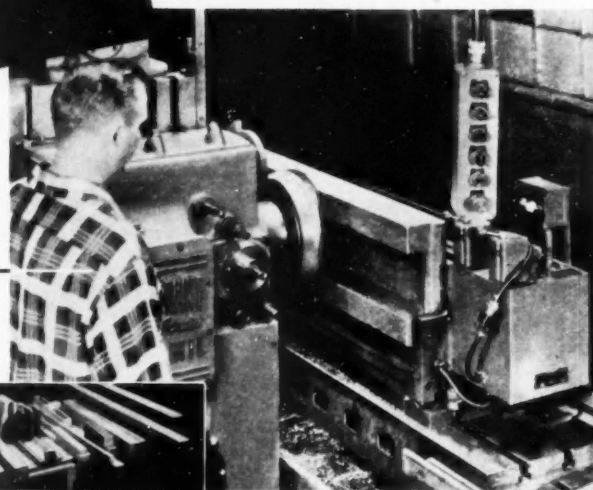
Get Profitable Methods plus Advanced Machine Design

from . . .

SUNDSTRAND
"Engineered Production"
Service

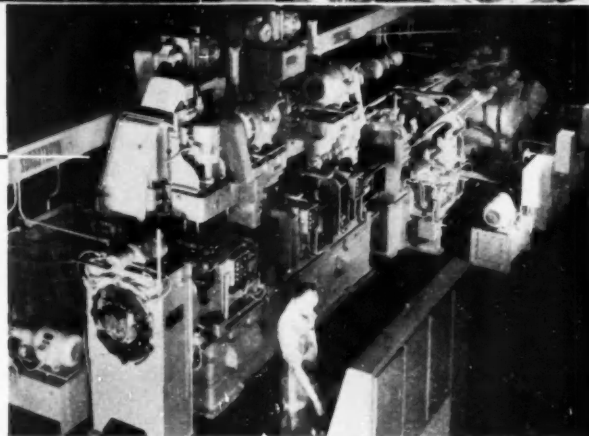
Small Lot Milling with Fast Magnetic Clamping

Sundstrand Model 33 Rigidmil equipped with a Sundstrand Magnetic Fixture. Parts machined include tool blocks, cam bars, tool slides, motor brackets, etc. Lot sizes vary from 1 to 25 pieces, and time reduction averages 50% over former method. In addition to saving time through the elimination of mechanical clamps, these magnetic fixtures save the costs of special jigs or fixtures.



Multi-Station Automatic Transfer Rigidmil

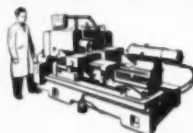
Here is an interesting example of Sundstrand "Engineered Production" as applied to interlocking several machine elements into continuous flow production. It is a Sundstrand special purpose 9 station transfer or process type machine designed and built to drill and ream locating holes, mill bearing sides and odd pads on cylinder blocks. Controls are operated from a floor mounted console type control station and are designed to cycle the complete unit individually or provide complete interlocking of the cycle with several other machines. Production is 80 pieces per hour.



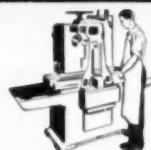
"Engineered
Production"
Service*

*REG. U.S. PAT. OFF.

AUTOMATIC LATHES



SIMPLEX RIGIDMILS



DUPLEX RIGIDMILS



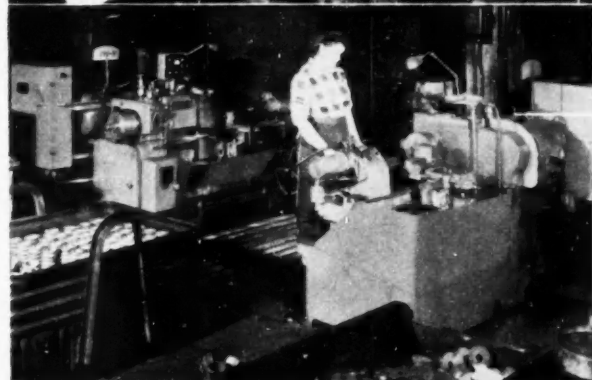
Here are some representative examples of machine tools and services offered by the Machine Tool Division of Sundstrand. Standard basic machine designs and units, coupled with methods engineering assistance, have resulted in many cost-saving Sundstrand installations. If you have metal working operations in your plant and are interested in lowering manufacturing costs, call in a Sundstrand representative. He'll be glad to assist you in obtaining more economical methods. There is no obligation for this service.



Hopper Loading for Production Turning

This Sundstrand Model 8A Automatic Lathe turns and chamfers three different lengths and diameters of master track link pins. Operator loads parts into a hopper loader and automatic machine cycle is started with chucking of part.

When machine cycle is completed and the front slide has returned to the starting position, a work ejector pushes the pins out of the chuck and into the unloading vee. Machine will run automatically with one filling of the hopper for approximately 10 minutes.



Small Lot Turning

Illustration at left shows two of a battery of Sundstrand Automatic Lathes that increase production better than 2 to 1 over former method. Lot sizes, for the many different parts run over these machines, vary from 150 to 200 pieces. Parts are of cast iron and steel and are used in production of heavy machinery. The units in this battery of Automatic Lathes are installed with facing fronts, as shown in the above illustration. Because of the simplicity of operation, one operator can easily run two machines.



Multi-Station Automatic Indexing Machine

Special Sundstrand Five Station Process Machine for milling port faces and angle pads, drilling port faces and counter-boring angle pad of manifold part. This irregularly shaped part is located and clamped at station #1 and then indexed thru the remaining four work stations to complete the machining with one handling of the workpiece. Production is approximately 115 pieces per hour.

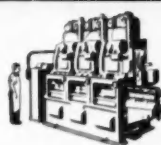
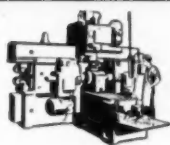
FREE DATA

Additional information on the complete line of Sundstrand machines is available. Ask for bulletin SP-137, ST-137, and 236.



TRIPLEX RIGIDMILS

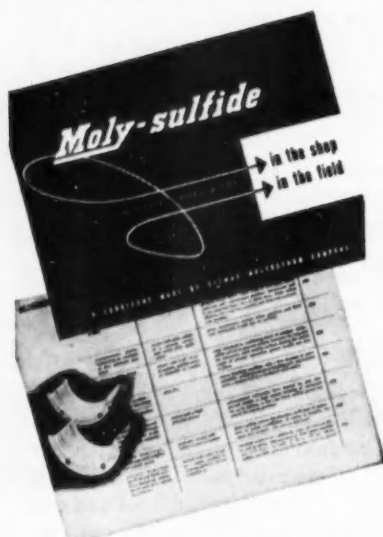
SPECIAL MACHINES



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154 varied applications of molybdenum sulfide in the shop and in the field are described in a new booklet now available. This solid-film lubricant has demonstrated unique anti-friction properties under conditions of extreme pressure, high velocity, elevated temperature, or chemical attack.

The 40-page booklet contains the records of solved lubrication problems—some might solve your own.

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SHORTIES

Slightly more than half of the 3.3 million-mile U. S. road and street network now is surfaced.

Some 37 per cent of the 351,000 miles of surfaced rural state primary highways are less than 20 ft wide, while those 27 ft or more wide amount to six per cent.

A good index of relative fuel economy is the fact that the DC-6B consumes 8.9 lb of fuel per mile. The jet aircraft of about the same size will require about 20.4 lb of fuel per mile.

More than 11 million barrels of Diesel fuel are produced each month by U. S. refineries.

About 33.726 million gal of motor oil were sold through car dealer shops, garages, chain stores, etc., in 1952.

Consumption of gasoline in 1952 rose to an all-time peak of 46.4 billion gal.

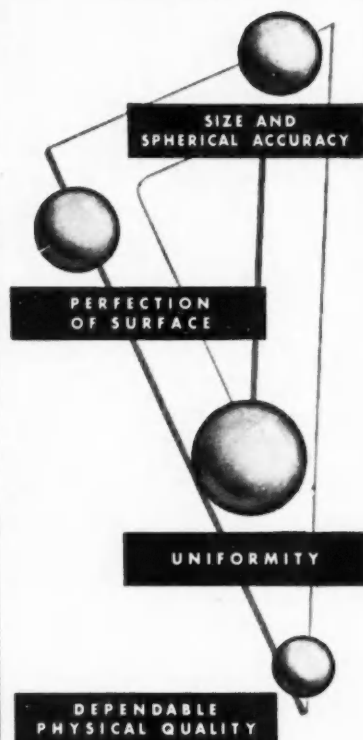
There were 53 million motor vehicles traversing our highways in 1952—for a total distance of 517 billion miles.

Transports built by one major aircraft manufacturer have flown more than 53.3 billion miles—far enough to take a plane to the moon and back 100,000 times.

A new Navy fighter weighs more than a standard twin-engined commercial airliner complete with its two pilots, hostess, 21 passengers, their luggage, and the usual mail load.

There are more cars than telephones on American farms.

from any angle



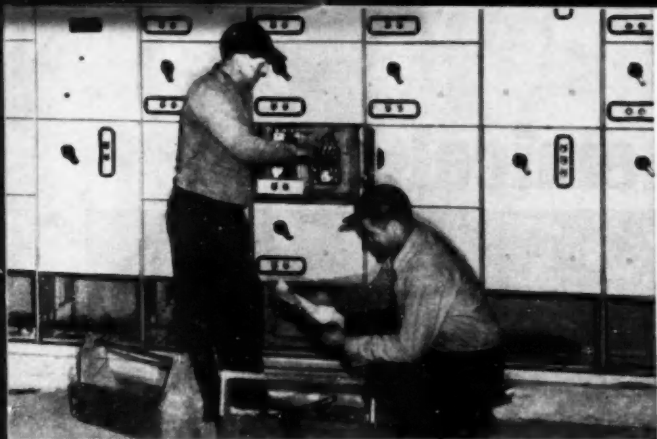
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BEST BALL BUY

If you have a metal ball problem, why not let Strom solve it for you. Whether for precision ball bearings or for one of many other ball applications... Strom will supply the *right* ball to meet your requirements. For more than a quarter century, industry has looked to Strom for metal balls of unsurpassed quality.

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EASY-TO-INSTALL front-connected units and a large, accessible 13-inch conduit space make wiring fast. Lightweight, compact, strong units with stab-on connectors make handling easy.



A G-E PACKAGED JOB and proven dependability of G-E motor control centers sold the planning team of George Sall Metals Company and Kuljian Corporation engineers on specifying G.E.



STEEL BARRIERS isolate live busses from personnel for maximum safety during inspection and maintenance. Disconnect position allows safer maintenance without shutting down the center.

G-E Motor Control Centers Specified For New "Automatic" Processing Plant

The Kuljian Corporation, Philadelphia, engineers and constructors, specified G-E motor control centers to help in the "automatic" processing of scrap metal at the non-ferrous-smelting plant of The George Sall Metals Company in Philadelphia. Like other industries—chemical, paper, automotive—where automatic control is important, George Sall Metals wanted the most modern up-to-date equipment available. They had the plant planned for the ultimate in economical and automatic processing.

Whether you are building a new plant or modernizing

existing facilities, specify G-E motor control centers for centralized control of a-c motors up to 200 horsepower.

FOR MORE INFORMATION, contact your nearby General Electric Apparatus Sales Office or authorized distributor, or write Section 781-5 for Bulletin GEA-4979A today. General Electric Company, Schenectady 5, New York.

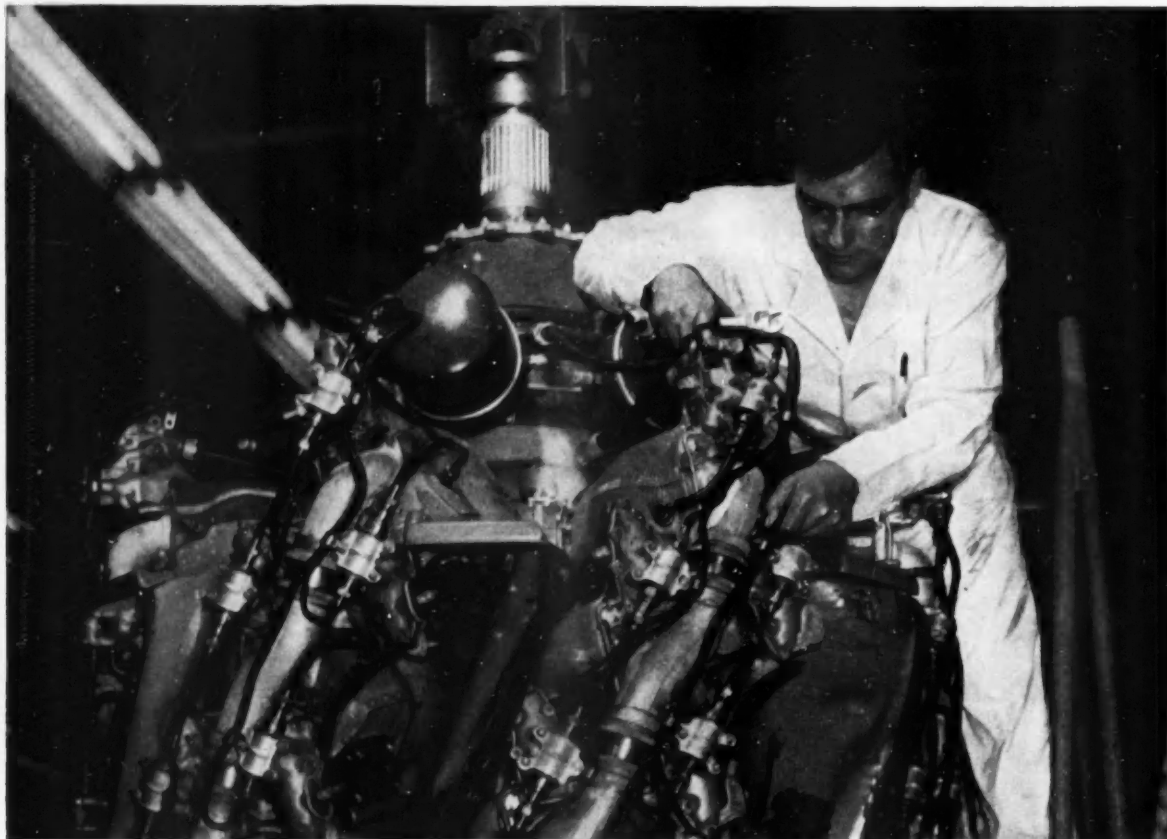


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GENERAL  ELECTRIC

Another new development using

B. F. Goodrich Chemical raw materials



B. F. Goodrich Chemical Company supplies only the Geon latex. Scintilla Magneto Division, Bendix Aviation Corp., Sidney, New York, manufactures and supplies the harness to United Air Lines.

FOR ENGINES—MORE SAFETY, LOWER MAINTENANCE

with Geon coated harness

This is a Pratt and Whitney Wasp Major 28 cylinder engine that powers United Air Lines huge Boeing Stratocruisers—and does a better job because of a new type low tension ignition harness. The harness is subjected to physical strains, along with chemical reactions, which formerly caused the covering to chafe through the insulation to the conductor. Now all 7 harnesses on each engine are protected by an outer coating of Geon vinyl plastic latex, which improves engine

safety, lowers maintenance costs.

Besides giving improved abrasion resistance, the Geon vinyl latex cover provides better moisture and water protection and resists the effects of mineral spirit solvents while the engine is being flushed clean. Like all Geon vinyl plastic materials the coating also assures resistance to oils, greases, alkalies, acids, chemicals and will not support combustion.

What Geon does for this wire coating may start you thinking about how Geon materials can help you improve or develop more saleable

products. We'll be glad to give you helpful, technical advice. For information, please write Dept. HG-10, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.



GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable
GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors

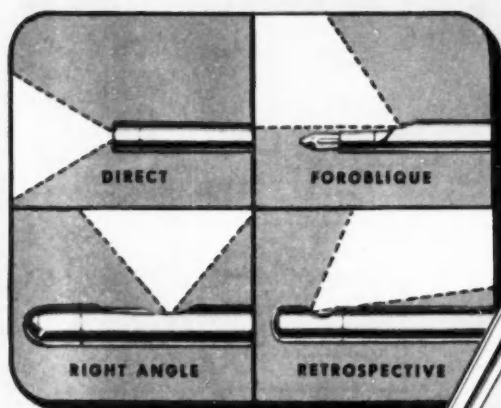
INSPECTION OF CONFINED AREAS FACILITATED

NECESSITY OF DISMANTLING AVOIDED

TIME SAVED—MONEY SAVED



A.C.M.I. BORESCOPES



A.C.M.I. Borescopes are available in
4 angles of vision (as above)—
in diameters of .120" to 4.00"—
in lengths of 4' to 720'.
Special models for
special problems.

The A.C.M.I. Borescopes
permit close-up visual
examination of interior areas
and surfaces not otherwise
visible. They save time
and money, and prevent costly
dismantling, by providing
a practical solution to a wide
variety of inspection problems.

In maintenance and inspection work,
on small internal bores, machine
parts or castings, to large boiler tubes,
chemical plants, process equipment, or
other industrial installations, an A.C.M.I.
Borescope may be the answer to *your* problem.

Each Borescope is a compact, self-illuminated
industrial telescope of highest quality, employing
a precision optical system, that produces a flat
visual field. Lens systems are fully corrected for
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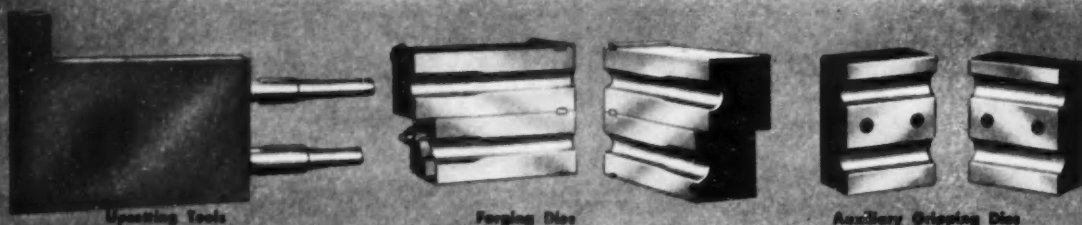
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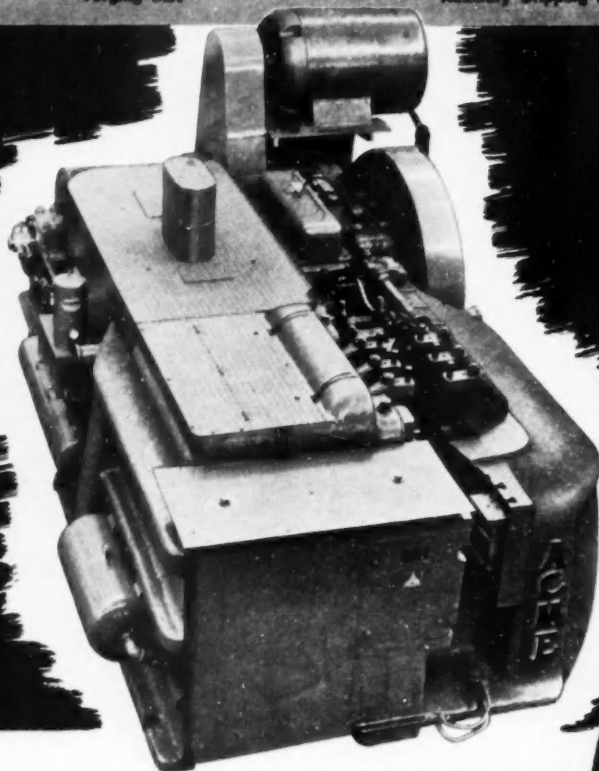


Upsetting Tools

Forging Dies

Auxiliary Gripping Dies

TUBE UPSETTING with an ACME XN FORGING MACHINE



This 4" ACME XN Forging Machine is adapted for upsetting steel pipe or tubing, thickening the tube wall at the ends so that it can be threaded. An auxiliary gripping attachment holds random lengths of tubing during the upsetting operation. Basic features of ACME XN design are retained to insure maximum efficient operation on long production runs. While principally used in the oil well industry, other profitable applications of this special equipment are apparent.

A.P.I. tube upset for
OIL FIELDS from 4"
ACME XN Forging
Machine. Est. pro-
duction—300 per Hr.



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See what adhesives are doing today!



Announcing a new 3M weatherstrip adhesive



ADHESIVES • COATINGS • SEALERS

Here's a new 3M adhesive, developed especially to withstand the high-temperature extremes encountered in extensive periods of hot-weather driving.

It's EC-1300—a new, fast-grabbing weatherstrip adhesive that has been rigorously tested and *proved* in the field by leading automotive companies. Results of these tests show that EC-1300 successfully resists interior car temperatures up to 158° F. (This temperature was recorded in one of the cars tested on a desert run.)

What's more, EC-1300 takes hold quicker than any previous 3M weatherstrip adhesive. This means not only faster production but better production, too.

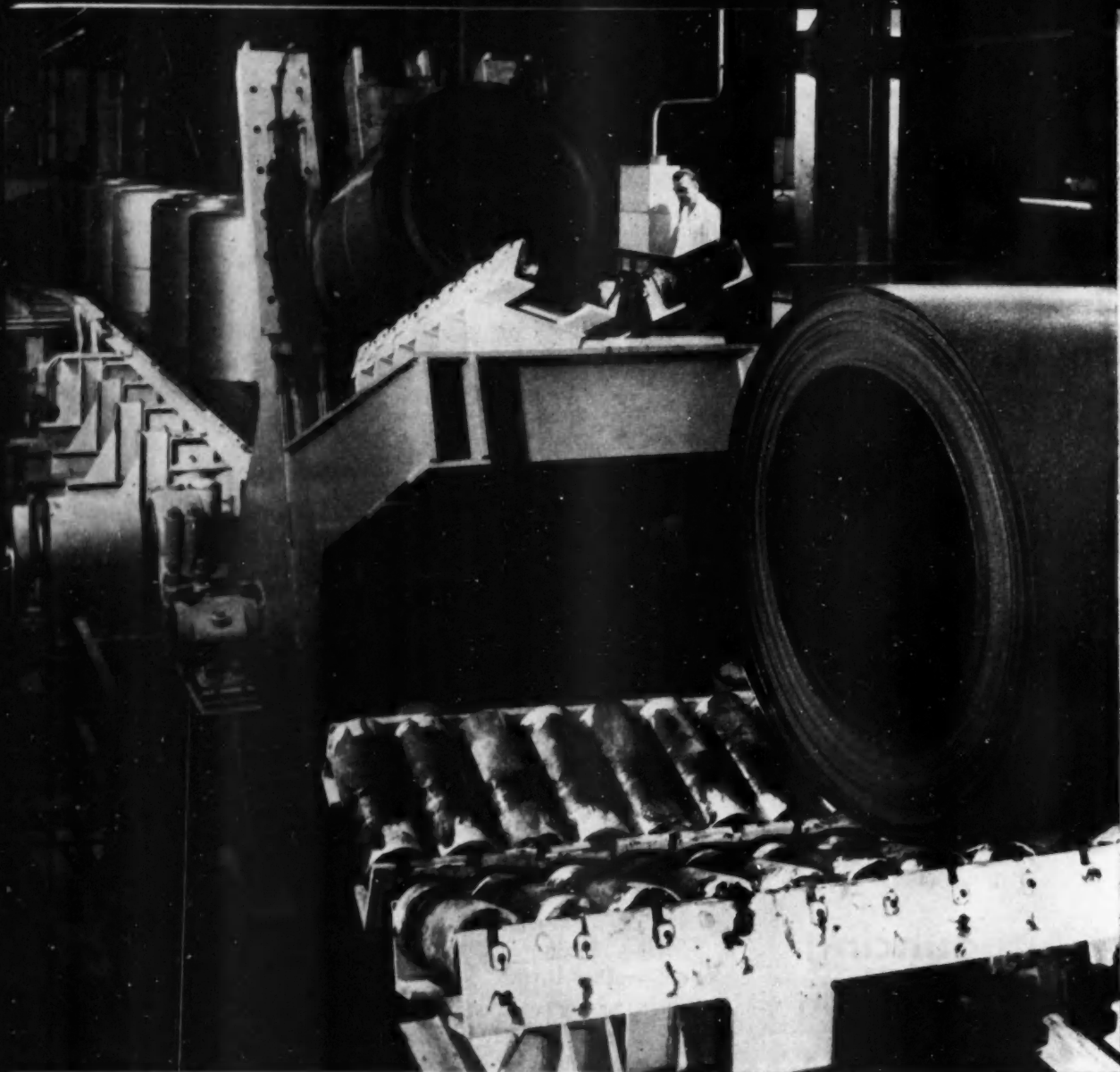
See what adhesives can do for you . . .

If weatherstripping is one of your operations, you'll appreciate EC-1300. It is by far the best weatherstrip adhesive ever made by 3M, supplier of tailored adhesive products for the automotive industry. For more detailed information, contact your 3M salesman, or write to 3M, Dept 1010, 417 Piquette Ave., Detroit 2, Mich.

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By knowing in advance what and how you manufacture . . .

Pittsburgh Steel custom builds sheet steel to meet your production line requirements

Metallurgists start each sheet order with selection of correct raw materials, then control each process from blast furnace to proper packaging for shipment to customer.

Manufacturers of automobiles, household appliances, construction machinery, building materials, and the hundreds of other useful products made from steel sheets must meet keen competition . . . they must be able to turn out quality products at the lowest possible prices and make a reasonable profit.

Pittsburgh Steel wants to be sure its customers get a better than even start. To do this, it has adopted a policy of custom building its sheet steel to meet your production requirements, making certain the sheet you order will meet specifications.

Here's how alert men in the metallurgical department have been able to

hit top-quality hot rolled sheets right from the start. First, they have a brand new mill, the newest and most modern of its type in the country. They also have the latest gauges, controls and testing apparatus for assuring quality.

They have another working tool—one that can't be bought and installed



Analyzing for Carbon—Bill McShane, Assistant Chief Chemist, holds steel chips the size of finely ground coffee. He is showing them to Combustion Chemist, Charles Keznor, who will weigh and put them into the electric carbon combustion furnace at right, where chips are burned in a stream of oxygen. The carbon dioxide formed is absorbed into a bulb. It is then weighed and the amount of carbon in the steel calculated accurately.



Studying Internal Quality—Highly polished samples of steel strip mounted in plastic are examined on this inverted metallurgical microscope. Shown above, George Chapman, supervisor of the metallurgical lab, is preparing to inspect the grain structure of the steel. Lack of foreign elements in the steel indicates that it is clean steel.

like a machine—which is the most important of all. It is the human element, the willingness, the desire of every man along the line from raw materials to shipping room to cooperate with each other to turn out the finest, the best-quality flat rolled steel that has yet been rolled.

Pittsburgh Steel's metallurgists believe in close cooperation—not only with the men they work with, but the men they work for—the customers. That's why they prefer to visit a customer's plant before the sheet order is entered. They observe manufacturing processes, see how sheets are being shaped, study blueprints, get all the information necessary in order to determine their recommendations for the best chemical analysis of steel, the correct internal structure, surface finish, what size sheets will work best.

When specifications are approved by the customer, the next step is to assemble the best grades of raw materials—the iron ore, coke, and limestone, then start at the blast furnaces. Through iron making, steel making, pouring ingots, rolling ingots into slabs, rolling slabs into hot rolled sheets—every operation and every process, Pittsburgh Steel metallurgists are on the job day and night around the clock making sure the order is being filled correctly.

What about results? Reports from customers indicate the metallurgists are hitting the mark. Thousands of tons of Pittsburgh Steel's sheet are "proving out" with highly satisfactory performance on scores of production lines.

If you use steel sheets in the manufacture of your products and you have a problem, why not talk to a man from Pittsburgh Steel?



Testing for Physicals—Metallurgist, Ben Labeka, checks the finished steel for physical qualities. Here he is, shown above, testing with an Olsen ductility tester, to check the steel for ductility and ease of forming for fabrication. Ben, one of the metallurgists who has helped set up the specifications of the steel after examining customers' blueprints and studying their fabricating methods, now knows that this steel will meet all requirements of the customer.



Where Coils Become Sheets—The hot shear line, built for continuous line processing of hot rolled steel, converts coils into individual high-quality sheets. A processor loosens any mill scale. A side trimmer trims the steel to exact width specification. A flying shear cuts the steel to lengths of 3 feet to 30 feet. The steel passes through two sets of levelling rolls to assure accurate flatness. Sheets are inspected and defective sheets rejected. Prime sheets are stacked at end of the line, weighed and banded for shipment.

"Everything New But The Name"

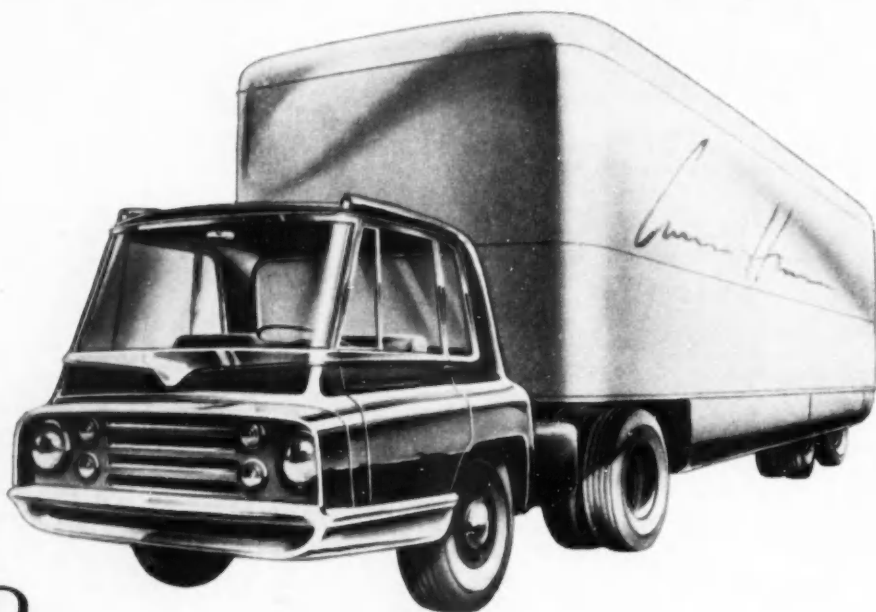
Pittsburgh Steel Company

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Sales Offices in Principal Cities Throughout the Country



Aluminum takes to the highways



Reynolds looks forward with America's Foremost Designers



Jon W. Hauser

This well known midwest designer's most recent contribution in the automotive field is the famous Tilt-Cab Truck for the Diamond T Motor Car Co. Other clients include Sears, Roebuck and Co., Hawley Products Co., The Frank O. Hough Company, Philco Corporation, Guardian Light Co., and Morgan's Inc.

This unique, functional tractor-trailer design calls for aluminum in the body, in the frame, in the outside and inside trim and in the mechanical parts wherever feasible. Mr. Hauser points out: "With the severe weight and dimensional limitations imposed on the trucking industry by various I.C.C. and state regulations, the use of aluminum can materially increase pay load by substantially reducing the dead weight."

From a trucking standpoint, the light weight of aluminum means faster acceleration and braking with longer brake and tire life. There is less maintenance, too, both because of less strain on the power plant and because aluminum does not rust.

Top industrial designers like Mr. Hauser are specifying more and more aluminum in their designs. Aluminum offers light weight with great strength, natural attractiveness, wide range of finishes, freedom from destructive rust, ease of fabrication, low cost, plus many other design and functional applications that would be impractical with other materials.

Consult Reynolds Aluminum Specialists about your design or production problems. Call the Reynolds office listed under "Aluminum" in your classified telephone directory or write Reynolds Metals Company, 2587 So. Third St., Louisville 1, Ky.

SEE "MR. PEEPERS" Sundays on NBC-TV. Consult local listings for time and station.

REYNOLDS



ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND



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But not here! We can offer you full-time engineering on some of the toughest problems facing any technical group — the development of advanced jet engines.

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At Pratt & Whitney Aircraft you'll work with the leader whose engines power 75% of the planes operated by the commercial airlines of the world. And you'll have the stability of a corporation with commercial and military sales last year in excess of \$600,000,000.

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Interested in building a career with a sound, well-managed company? Then send a resume to Mr. Paul Smith, Dept. AI 10.

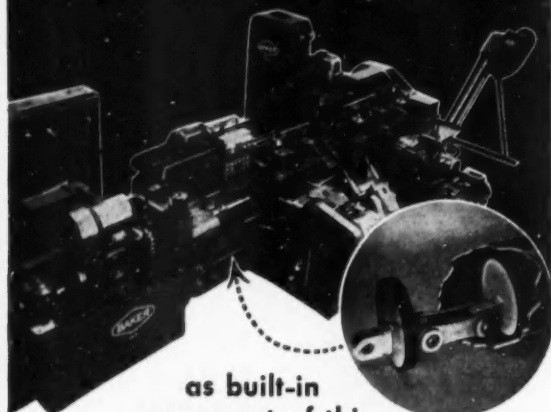
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helps speed production



as built-in
component of this
cost-cutting

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Take this Baker Multi-operation transfer-type Machine, for example. Hapman rubber-flighted sealed-pin Chain Conveyors carry off chips resulting from five distinct operations. On other applications, Hapman Conveyors carry grinding sludge, iron, steel and aluminum chips, welding flux, and dozens of other abrasive and corrosive materials.

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Write for your copy
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for details and applications



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SAVE *8 WAYS



MODELS TO FIT ANY
STOCK UP TO 96" WIDTH

Union is the foremost designer and manufacturer of roller coating machines for application of drawing or stamping compounds and protective coatings.

Models may be equipped with hardened steel, or with neoprene-covered rolls—also with heated or cooled rolls—to meet your individual requirements.

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- 5 "One helper eliminated."
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- 7 "Able to use salvage stock for some operations."
- 8 "25,000 more pieces before changing dies."

*The above claims are based on actual statements by users, both large and small—a number of whom have ordered a second and third machine.

Complete data and agent's name on request. Union will design and/or manufacture coating machines to meet your specific requirements.

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Multiform STEEL RULE

Die's

STEEL RULE
SINCE 1900

LET US SOLVE YOUR
DIE-CUTTING PROBLEMS
WITH RICHARDS' "TOUGH TEMPER"
STEEL RULE CUTTING DIES
HEADQUARTERS SINCE 1900
FOR DIES AND DIE MAKING
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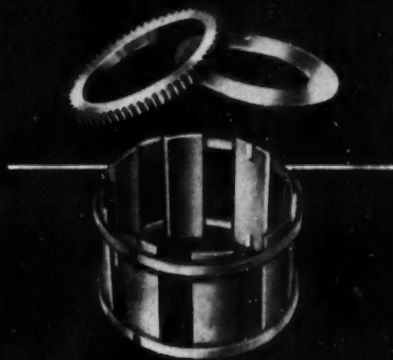
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The BASIC SHAPE of things to come!



WHEN you use Shelby Seamless Mechanical Tubing for hollow cylindrical parts, the basic shape—the tube—is already made.

You pick up the job where Shelby leaves off, and you find that it requires much less cutting or boring than solid bar stock or forgings would.

You fashion the most complex of parts, yet you produce them faster and at lower cost than identical parts machined from solid bar stock.

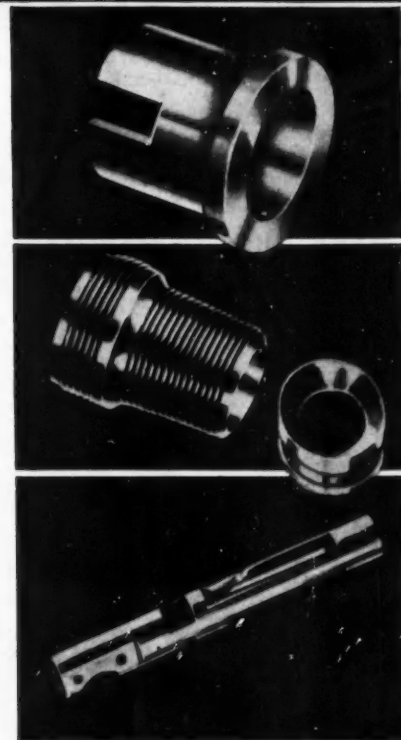
You turn out a far better precision product, yet fewer operations are involved, man and machine hours are reduced, rejects are fewer, and over-all parts production is speeded up.

In some instances, the use of Shelby Seamless Tubing has increased production to such a degree that savings of 50 percent have resulted.

Shelby offers you the high strength, the uniformity, the dependability that only *seamless* tubing can give. And it's available in a complete range of diameters, wall thicknesses, and analyses to meet the most exacting requirements. If you're interested in cutting production costs—and who isn't?—while turning out a superior product, send for our free Bulletin Number 17. And feel perfectly free to call on our engineers if you need help in applying Shelby Seamless Steel Mechanical Tubing to your product.

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UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
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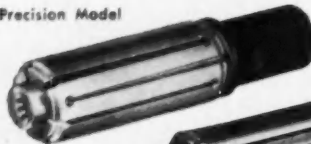


U·S·S SHELBY SEAMLESS MECHANICAL TUBING

UNITED STATES STEEL

CHAMPION E-X-P-A-N-D-I-N-G MANDRELS

Precision Model



Standard Model



**give
speed to
every set-up**

The flexible sleeve, mounted on tapered arbor, expands automatically to fit the hole. Inserted by hand — no arbor press needed. Always an exact, positive, concentric fit. Locked by a single mallet blow. Unlocked the same way. CHAMPION Expanding Mandrels are used in machine shops around the world. Save time, cut production costs, whether the job calls for machining one piece or a thousand.

Precision Model has expansion range of .010". Available in regular sizes to fit holes from 1/2" to 3" diam. Holds work to tolerances of .0002" run-out. Guaranteed for precision grinding, turning and milling operations.

Standard Model maintains close tolerances, handles material of any length bore, hard or soft metals — from thin tubes and bushings to heavy castings and forgings. A set of fourteen will fit every hole from 1/2" to 9 1/2" diam.

CHAMPION Expanding Mandrels can be made in special shapes and sizes to fit any specifications. Quotations on request. Write for descriptive folder today.

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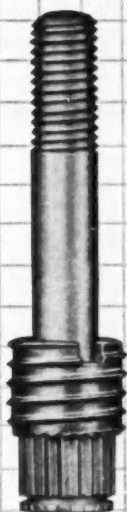
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| Foot-Burt Company, | — |
| The | — |
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| Corp. | — |
| Frechtown Porcelain | — |
| Co. | — |
| Frontier Bronze Corp. | — |
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| Greer Hydraulics, Inc. | — |
| Greer Stop Nut Co. | — |
| Gunito Foundries Corp. | — |

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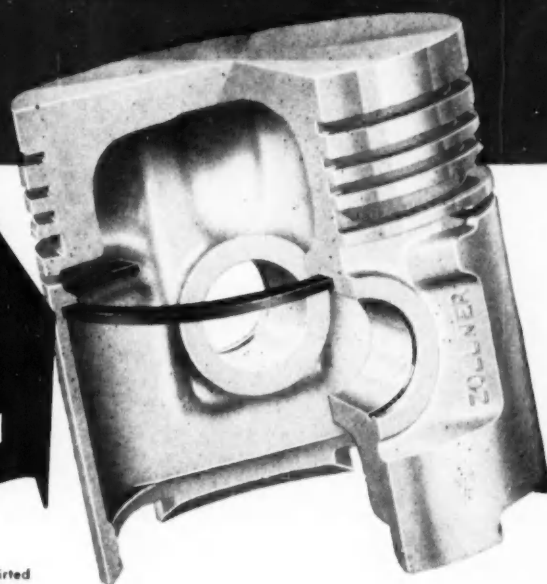
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